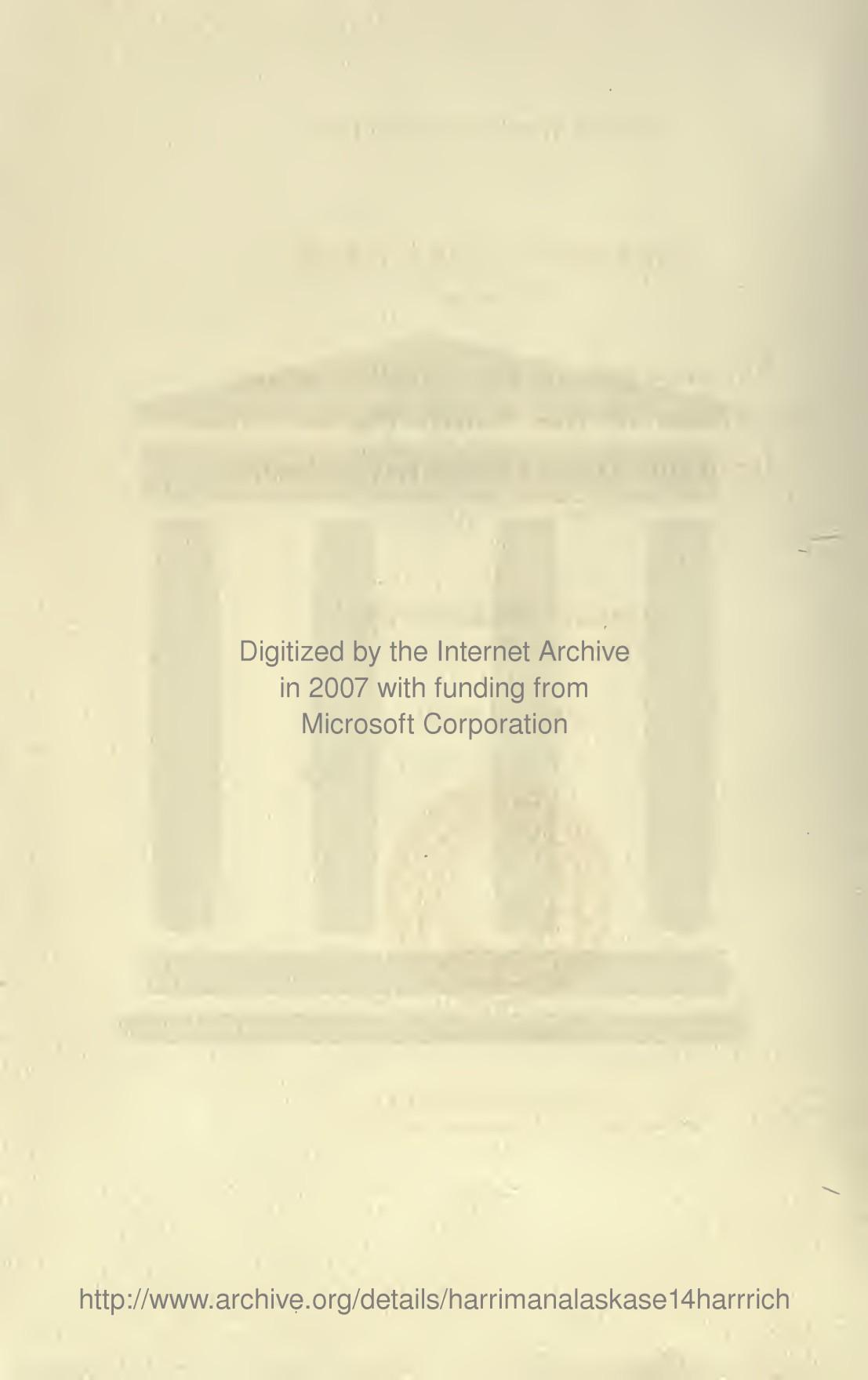






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HARRIMAN ALASKA SERIES

VOLUME XIV

Monograph of the Shallow-water
Starfishes of the North Pacific Coast
from the Arctic Ocean to California

(WITH 110 PLATES)

BY

ADDISON EMERY VERRILL
Professor Emeritus of Yale University

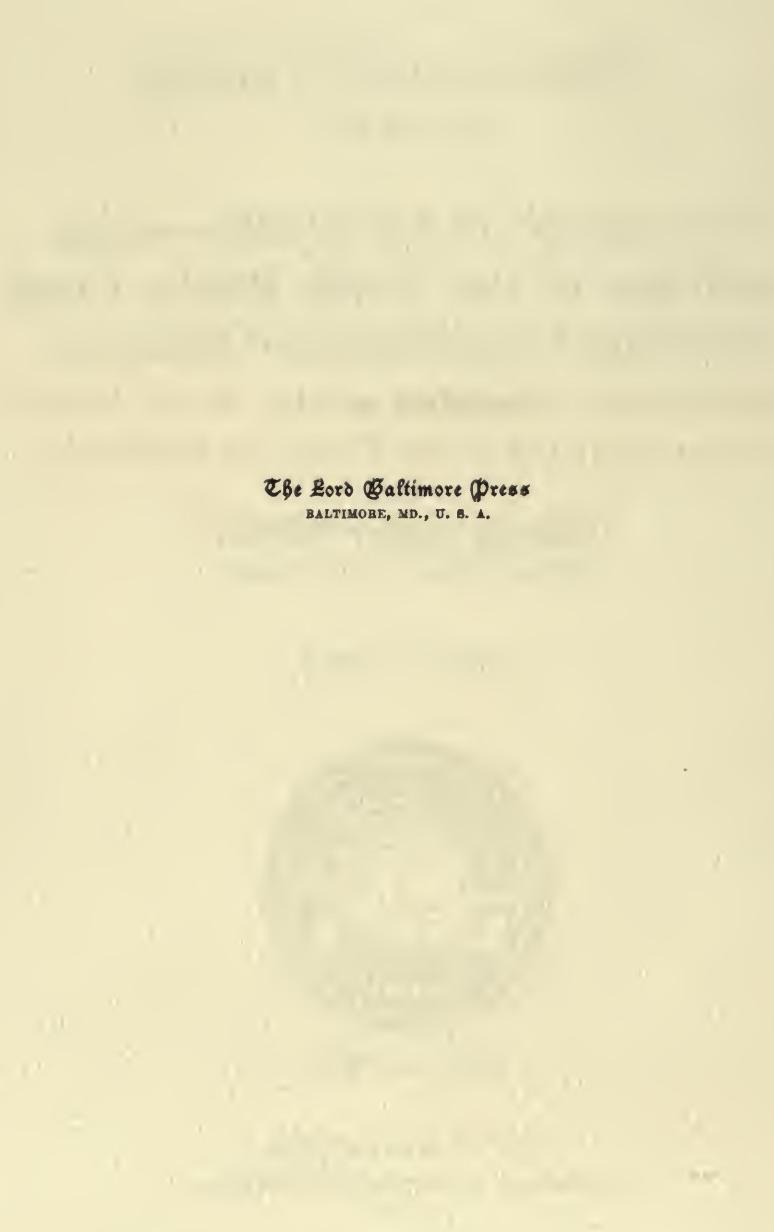
PART 2. PLATES



(PUBLICATION 2140)

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**Shallow-water Starfishes of the North Pacific
Coast from the Arctic Ocean to California**

PLATES I-CX WITH EXPLANATIONS

PLATE I.

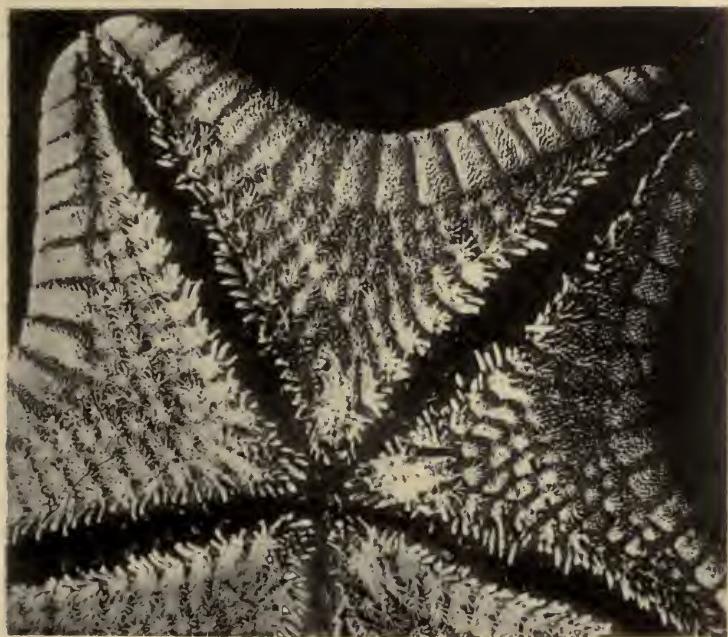
FIG. 1. *Glyphaster anomalous* (Fisher). Dorsal side; $\times 2$.

FIG. 2. The same specimen. Actinal side; $\times 4$. Alaska, Harriman Expedition.

1



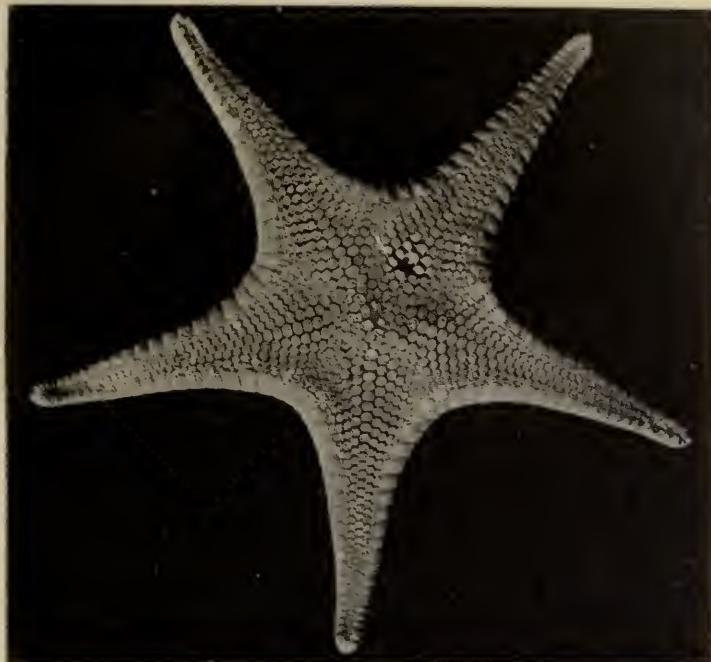
2



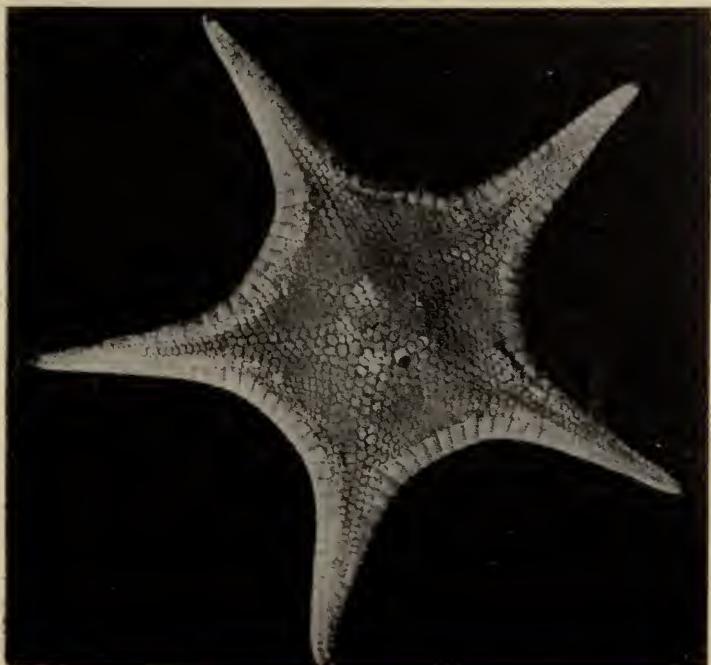
1, 2. *GLYPHASTER ANOMALUS* (Fisher)

PLATE II.

- FIG. 1. *Mediaster aequalis* Stimpson. Dorsal side; about natural size.
FIG. 2. *Mediaster bairdii* Verrill. Type. Dorsal side; about natural size.



2



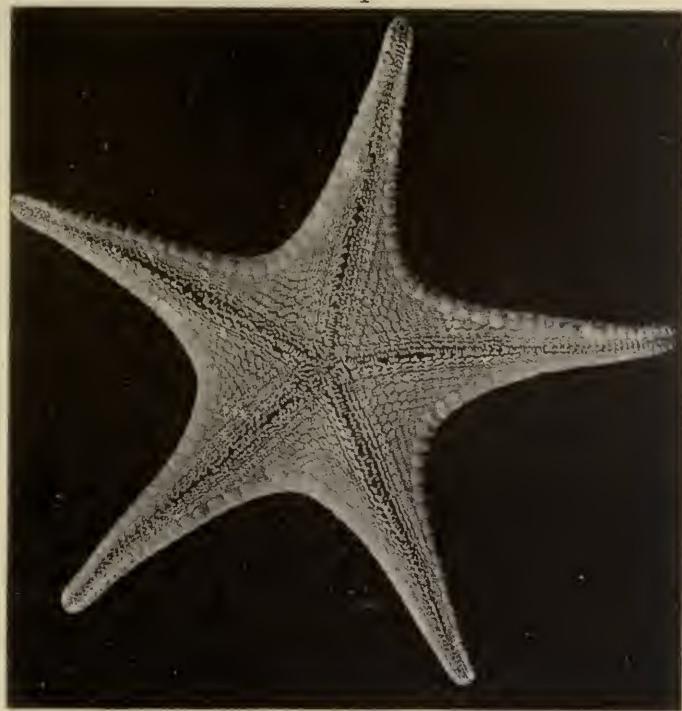
1. *MEDIASTER ÆQUALIS* Stimpson
2. *MEDIASTER BAIRDII* Verrill. Type

PLATE III.

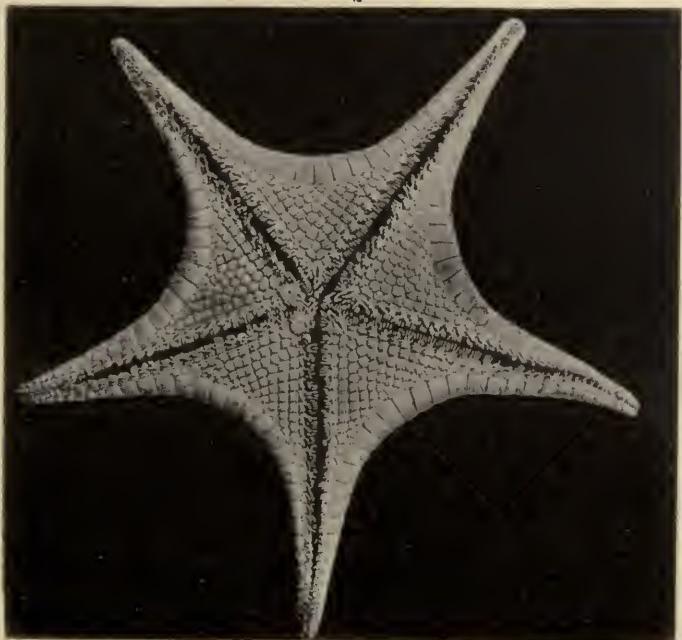
FIG. 1. *Mediaster aequalis* Stimpson. Ventral side; about natural size.

FIG. 2. *Mediaster bairdii* Verrill. Type. Ventral side; about natural size.

1



2



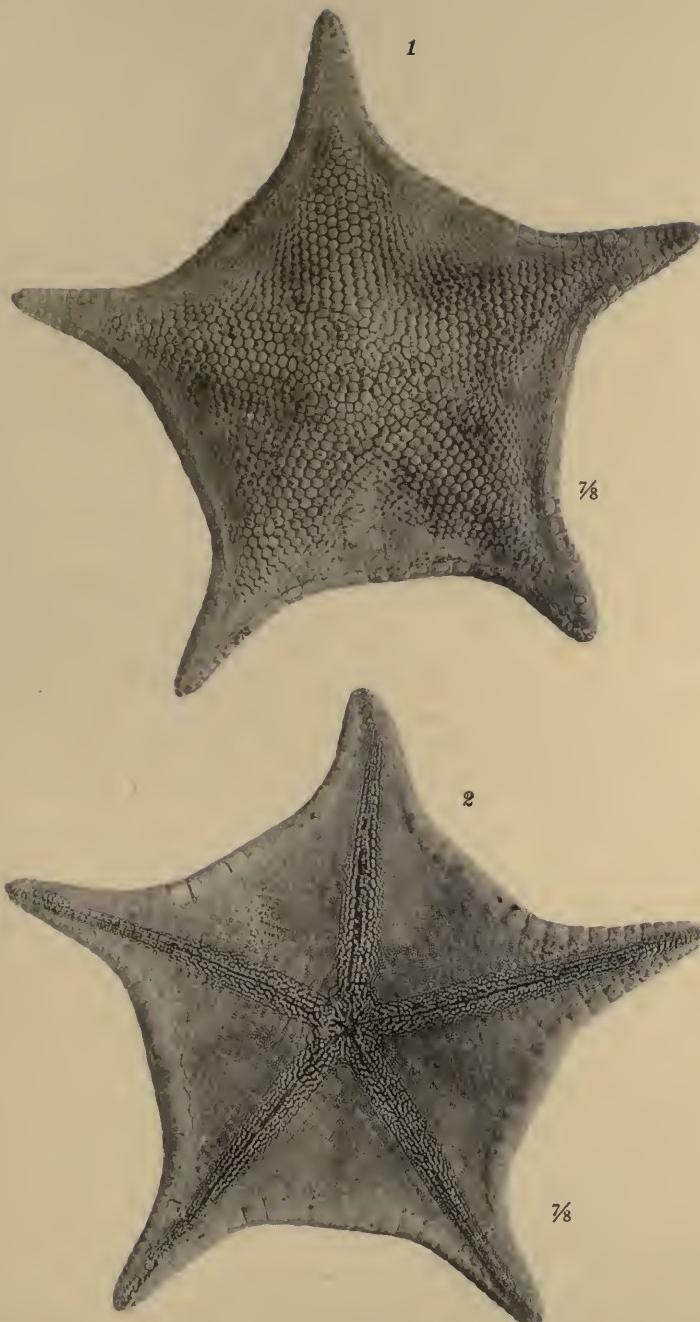
1. *MEDIASTER AEQUALIS* Stimpson

2. *MEDIASTER BAIRDII* Verrill. Type

PLATE IV.

FIG. 1. *Ceramaster granularis* (Retz.) Verrill. Dorsal side; about $\frac{7}{8}$ natural size. West Atlantic. Station 2506.

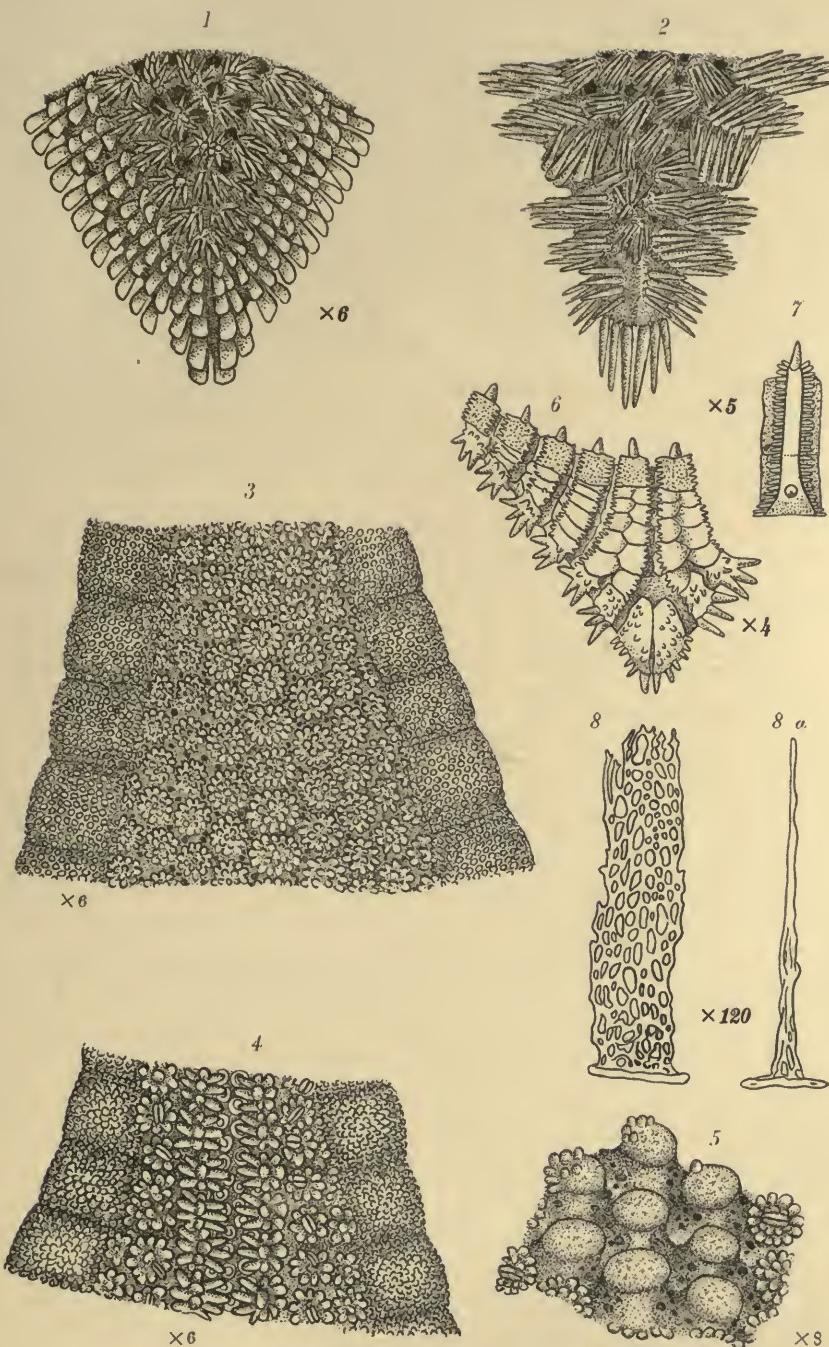
FIG. 2. The same specimen. Ventral side; about $\frac{7}{8}$ natural size.



I, 2. CERAMASTER GRANULARIS (Retz.)

PLATE V.

- FIG. 1. *Henricia leviuscula*, var. *spatulifera* Verrill. Type. One of the actinal interradial areas, jaws, and proximal adambulacral spines; $\times 6$. Monterey. Yale Mus.
- FIG. 2. *Crossaster papposus* (Linn.) M. & Trosch. An interradial area and jaw; enlarged.
- FIGS. 3, 4. *Mediaster aequalis* Stimpson. Portions of dorsal and actinal sides of a ray; $\times 6$.
- FIG. 5. The same. Portion of dorsal side of a ray with spinules removed, showing plates and papular areas; $\times 8$.
- FIG. 6. *Ctenodiscus crispatus* (Retz.) D. & Kor. Portion of an interradial area, inferomarginal plates, and jaws; after Ludwig, from a Bering Sea specimen; $\times 4$.
- FIG. 7. The same. Front view of upper and under marginal plates; $\times 5$. From the same.
- FIGS. 8, 8a. The same. One of the fasciolar spinules, side and profile views; $\times 120$. From the same.

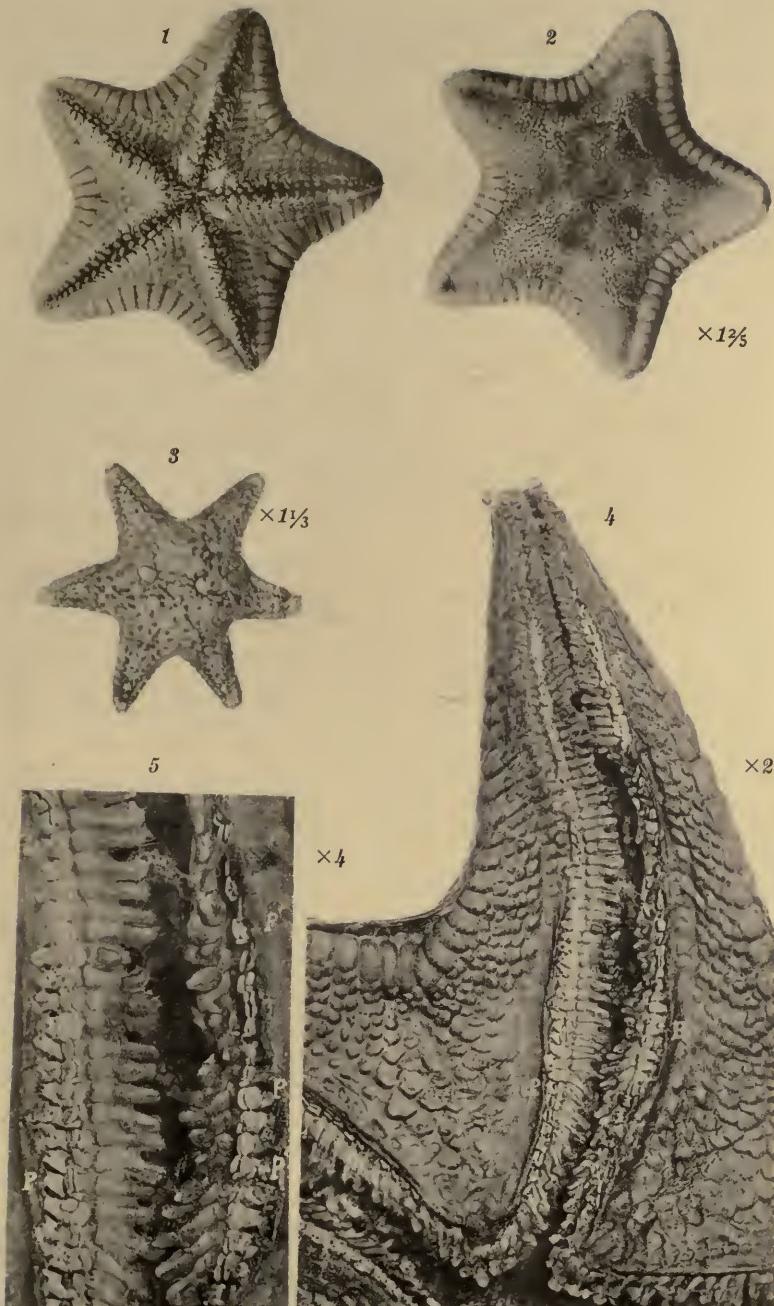


1. *HENRICIA LEVIUSCULA*, var. *SPATULIFERA* Verrill. Type
 2. *CROSSASTER PAPPOSUS* (Linn.)
 3, 4, 5. *MEDIASTER ÆQUALIS* Stimpson
 6, 7, 8. *CTENODISCUS CRISPATUS* (Retz.)



PLATE VI.

- FIG. 1. *Glyphaster anomalus* (Fisher) Verrill. Actinal side; $\times 1\frac{1}{2}$. British Columbia.
FIG. 2. The same specimen. Dorsal side; $\times 1\frac{1}{2}$.
FIG. 3. *Dermasterias imbricata* (Grube) Perrier. A young specimen, six-rayed. Dorsal side; $\times 1\frac{1}{2}$.
FIG. 4. The same, adult. Details of ventral side; P, P , pedicellariæ; $\times 2$.
FIG. 5. The same specimen. Portion more enlarged. P, P , bivalved pedicellariæ; P', P' , trivalved pedicellariæ; $\times 4$.

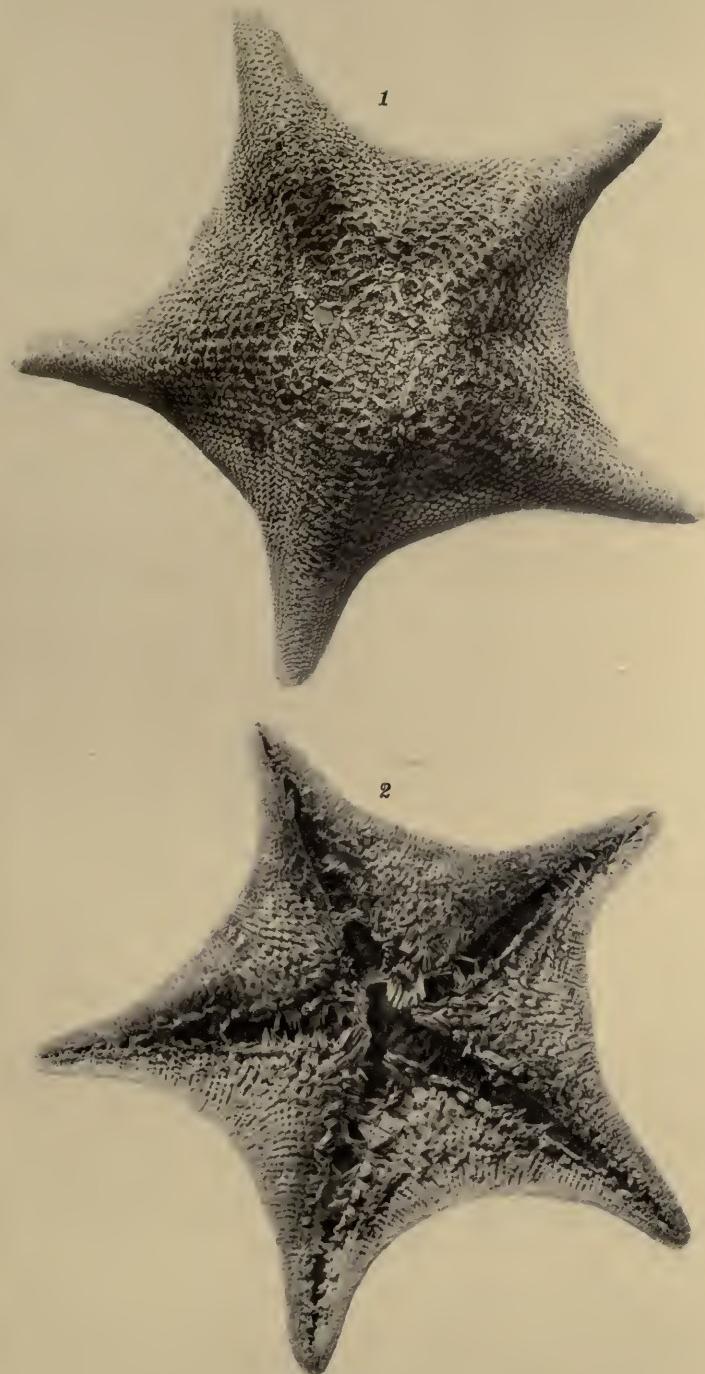
1, 2. *GLYPASTER ANOMALUS* (Fisher)

3. *DERMASTERIAS IMBRICATA* (Grube). A young six-rayed specimen

4, 5. The same, adult. Details of ventral side

PLATE VII.

FIG. 1. *Patiria miniata* (Brandt) Verrill. Dorsal side; about $\frac{3}{4}$ natural size.
FIG. 2. The same specimen. Ventral side. Yale Mus.

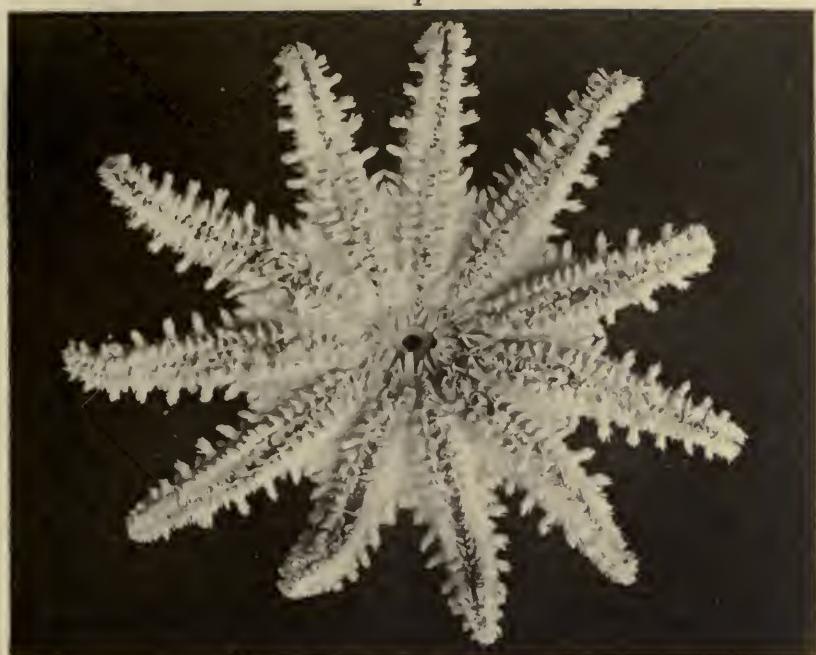


I, 2. *PATIRIA MINIATA* (Brandt)

PLATE VIII.

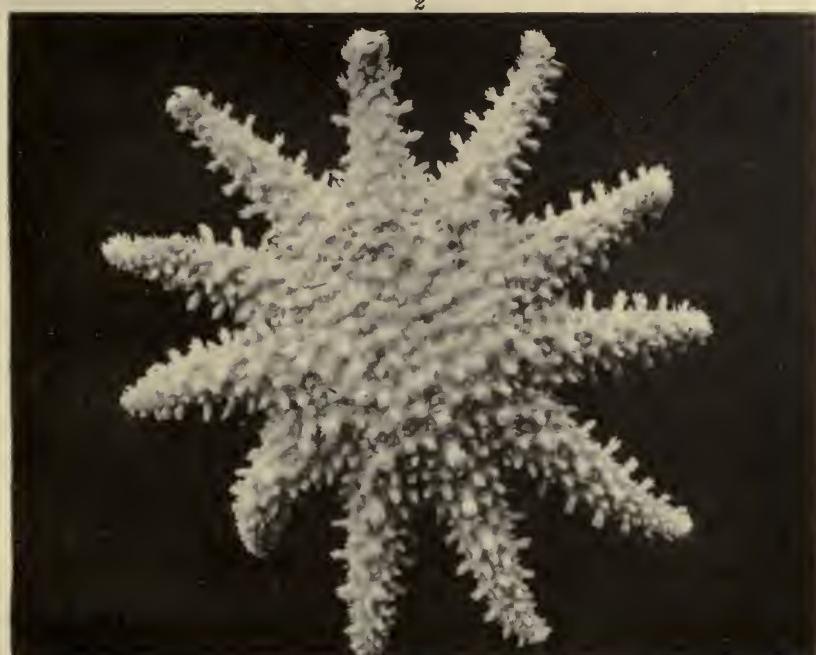
FIG. 1. *Crossaster papposus* (Linn.) M. & Troschel. A young specimen, in alcohol. Ventral side; $\times 1\frac{3}{4}$.
FIG. 2. The same specimen. Dorsal side; $\times 1\frac{3}{4}$. Berg Bay. Yale Mus.

1



×134

2



1, 2. CROSSASTER PAPPOSUS (Linn.)

PLATE IX.

- FIG. 1. *Leptasterias coei* Verrill. Type. In alcohol; $\times 2\frac{1}{2}$. Alaska, Harriman Expedition. Yale Mus.
- FIG. 2. *Solaster endeca* (Linn.) Forbes. Young. Dorsal side; $\times 1\frac{1}{8}$. Harriman Expedition.
- FIG. 3. The same specimen. Ventral side; $\times 1\frac{1}{8}$. Juneau, 20 fathoms.
- FIG. 4. *Crossaster papposus* (Linn.) M. & Troschel. Details of dorsal side of a young specimen in alcohol; $\times 2\frac{2}{3}$. Berg Bay, Harriman Expedition. Yale Mus.

 $\times 2\frac{1}{2}$

1



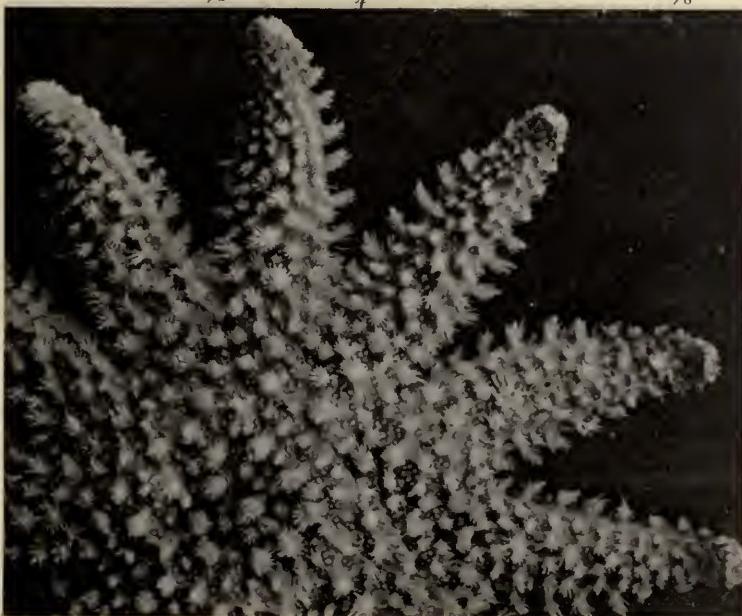
2



3

 $\times 1\frac{1}{8}$

4

 $\times 2\frac{2}{3}$

1. *LEPTASTERIAS COEI* Verrill. Type
- 2, 3. *SOLASTER ENDECA* (Linn.)
4. *CROSSASTER PAPPUS* (Linn.)

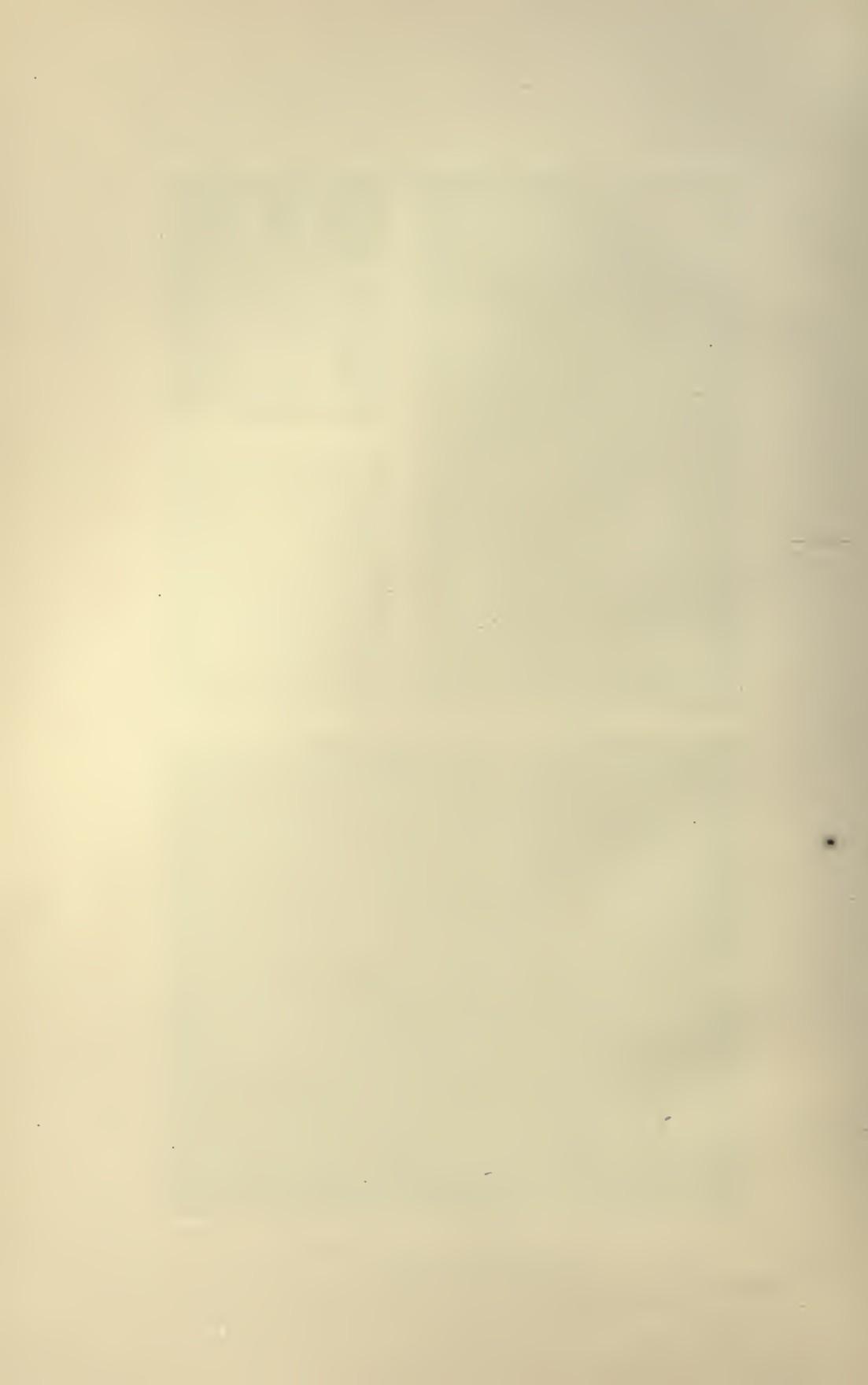
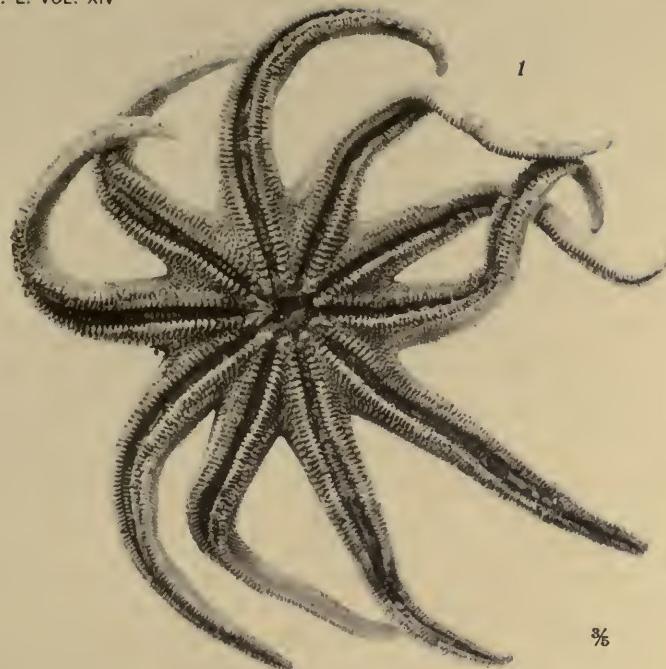


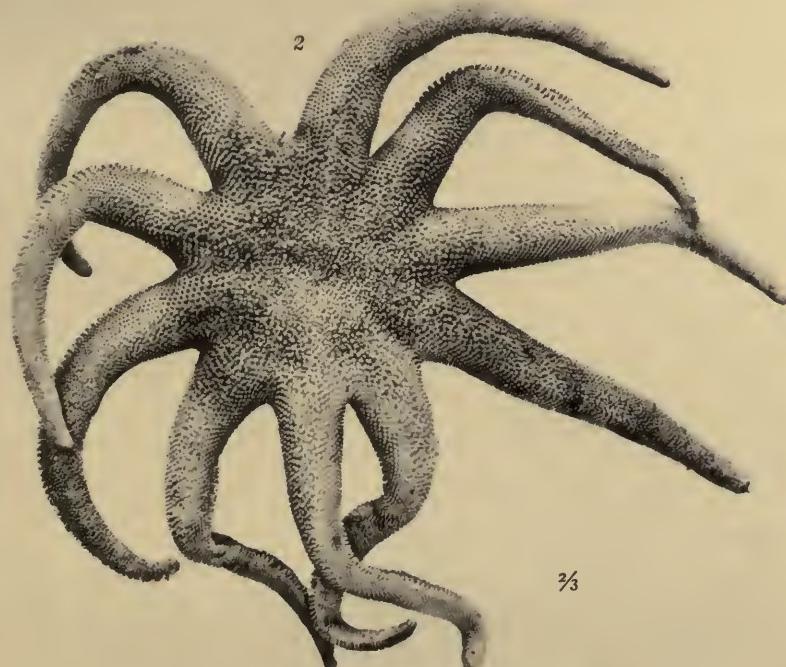
PLATE X.

FIG. 1. *Solaster stimpsoni* Verrill. Type. Actinal side; about $\frac{2}{3}$ natural size.
British Columbia. No. 5136. Yale Mus.

FIG. 2. The same specimen. Dorsal side; about $\frac{2}{3}$ natural size.



1
8/6

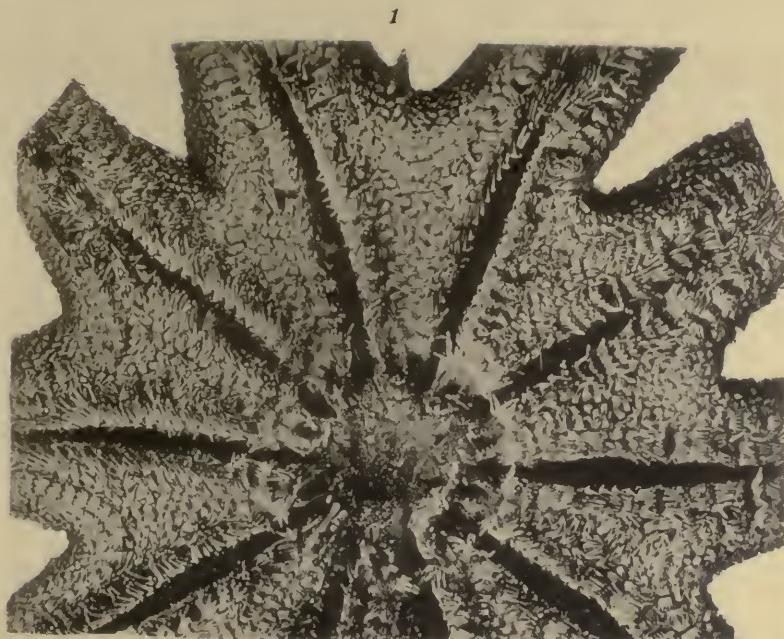


2
2/3

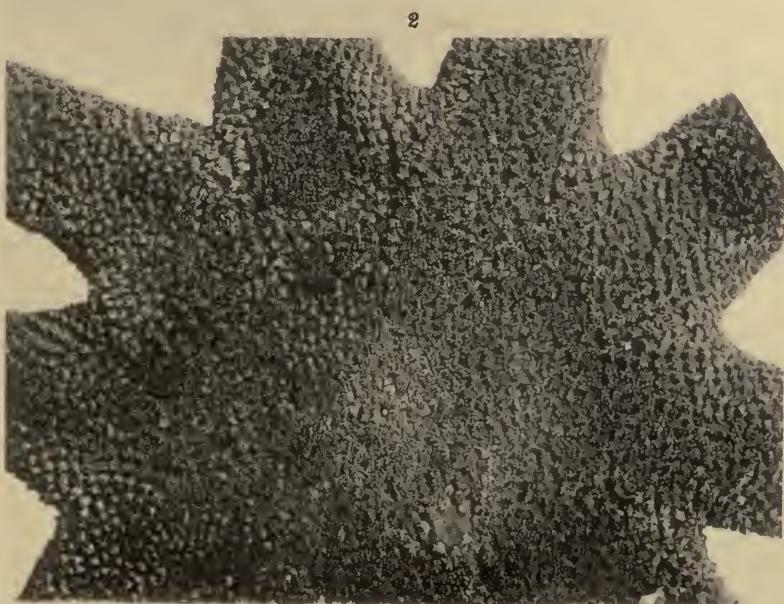
1, 2. SOLASTER STIMPSONI Verrill. Type. No. 5407, Yale Mus.

PLATE XI.

FIG. 1. *Solaster stimpsoni* Verrill. Cotype. Details of actinal side; $\times 1\frac{1}{2}$.
FIG. 2. The same specimen. Dorsal side; $\times 1\frac{1}{2}$.



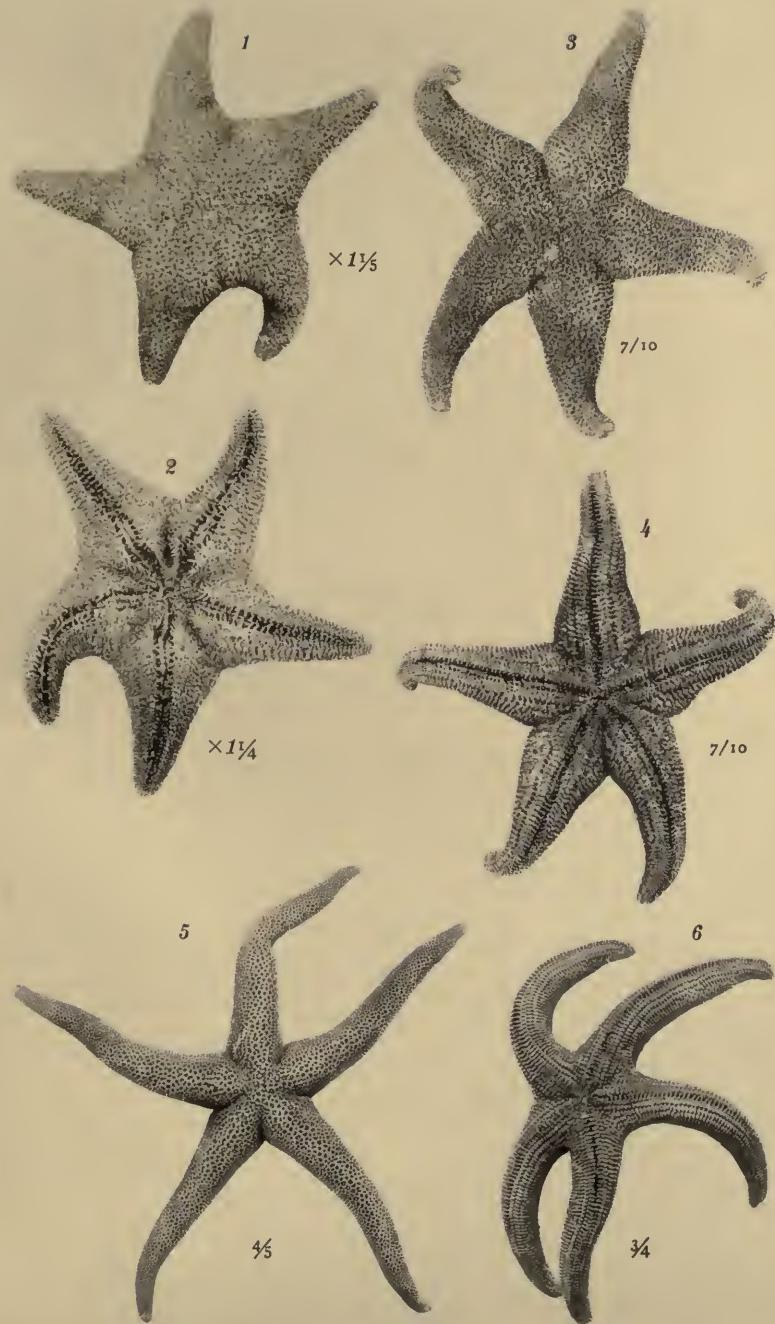
$\times 145$



I, 2. SOLASTER STIMPSONI Verrill. Cotype

PLATE XII.

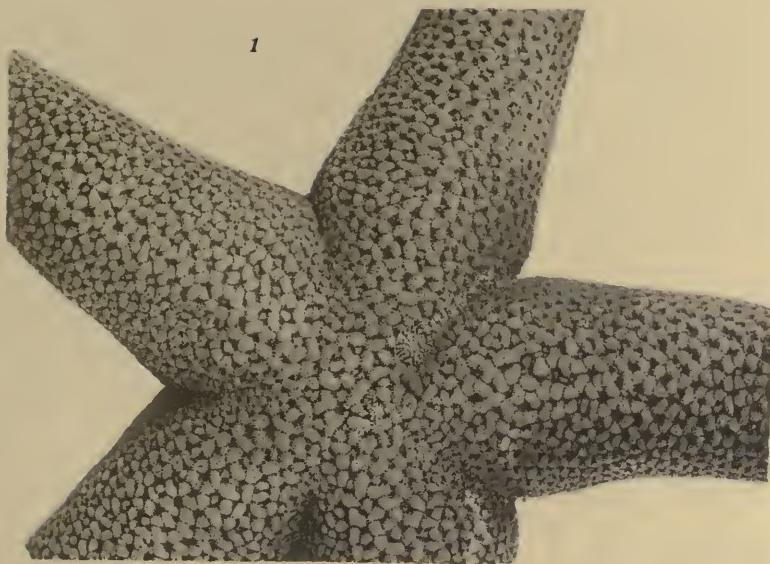
- FIG. 1. *Henricia tumida* Verrill. Type. Dorsal side; $\times 1\frac{1}{2}$. Yale Mus.
FIG. 2. The same specimen. Actinal side; $\times 1\frac{1}{4}$.
FIG. 3. *Henricia tumida borealis* Verrill. Type. Dorsal side; about $7/10$ natural size Dutch Harbor. Yale Mus.
FIG. 4. The same specimen. Actinal side; $7/10$ natural size.
FIG. 5. *Henricia leviuscula* (Stimpson). Typical form. Dorsal side; $\frac{3}{5}$ natural size.
FIG. 6. *Henricia leviuscula* (Stimpson), var. *dyscrita* Fisher. Actinal side; $\frac{3}{4}$ natural size.



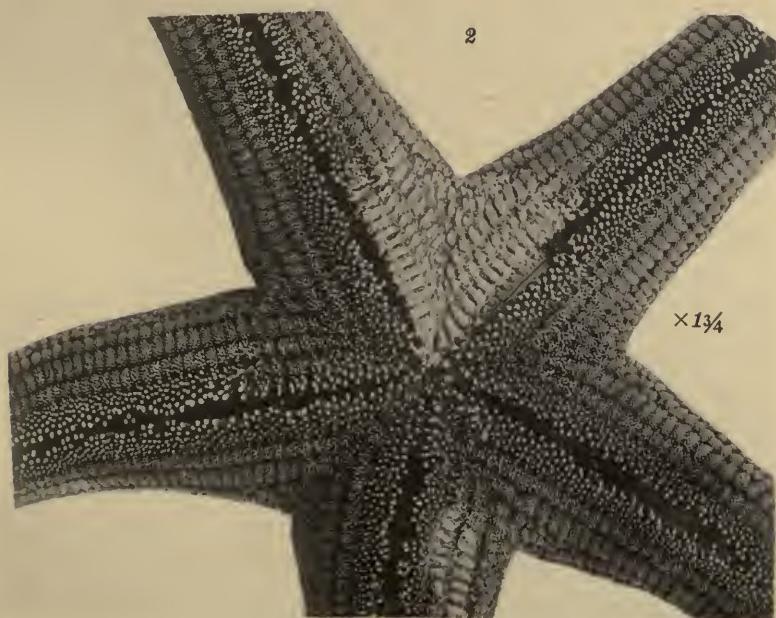
1, 2. *HENRICIA TUMIDA* Verrill. Type
 3, 4. *HENRICIA TUMIDA BOREALIS* Verrill. Type
 5. *HENRICIA LEVIUSCULA* (Stimpson)
 6. *HENRICIA LEVIUSCULA* (Stimpson), var. *DYSCRITA* Fisher

PLATE XIII.

- FIG. 1. *Henricia leviuscula* (Stimpson). Details of dorsal side of the typical form; $\times 1\frac{3}{4}$. Yale Mus.
- FIG. 2. The same specimen. Ventral side; with spines partly removed; $\times 1\frac{3}{4}$. Yale Mus.



1



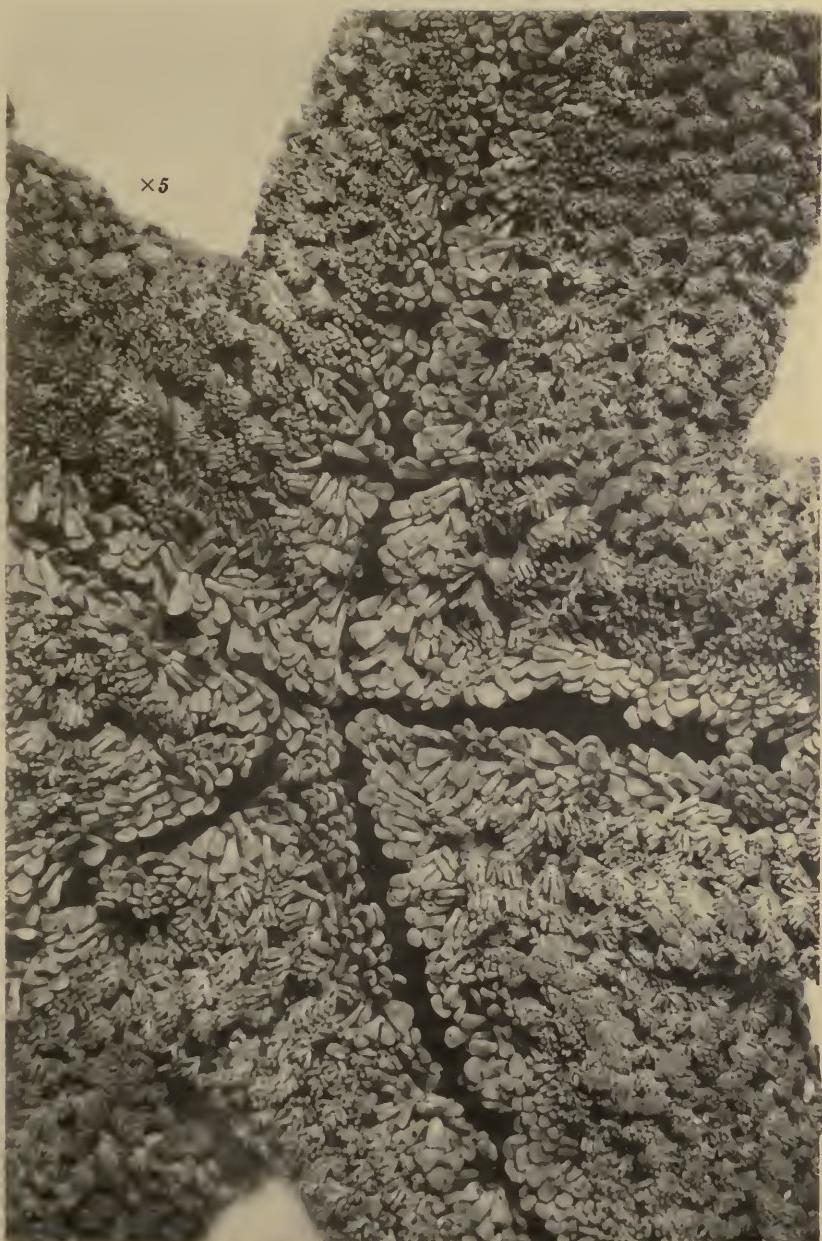
2

$\times 1\frac{3}{4}$

I, 2. HENRICIA LEVIUSCULA (Stimpson)

PLATE XIV.

FIG. 1. *Henricia leviuscula*, var. *spatulifera* Verrill. Type. Details of ventral side; $\times 5$. Monterey, Calif. Yale Mus., No. 2238.

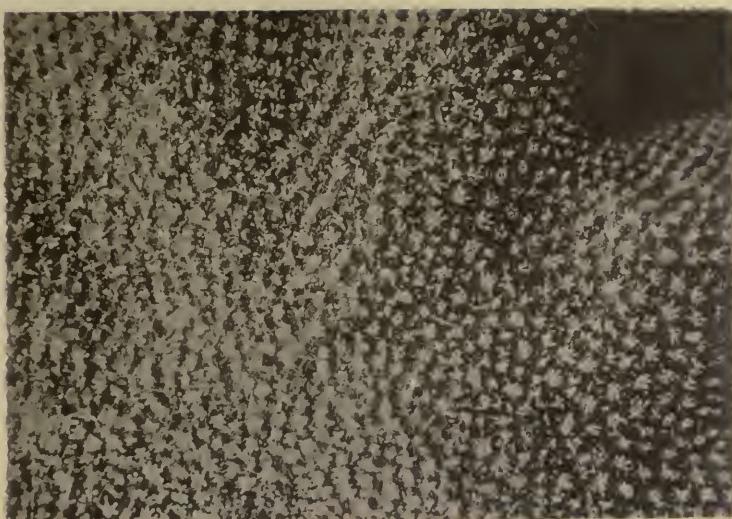


I. *HENRICIA LEVIUSCULA*, var. *SPATULIFERA* Verrill. Type

PLATE XV.

- FIG. 1. *Solaster stimpsoni* Verrill. Type. Same specimen as on pl. x (No. 5407, Yale Mus.). Details of dorsal side of disk; $\times 3$. Yale Mus.
FIG. 2. The same specimen. Details of actinal side; *O*, mouth; *t*, peroral spines; $\times 3$.

1



2

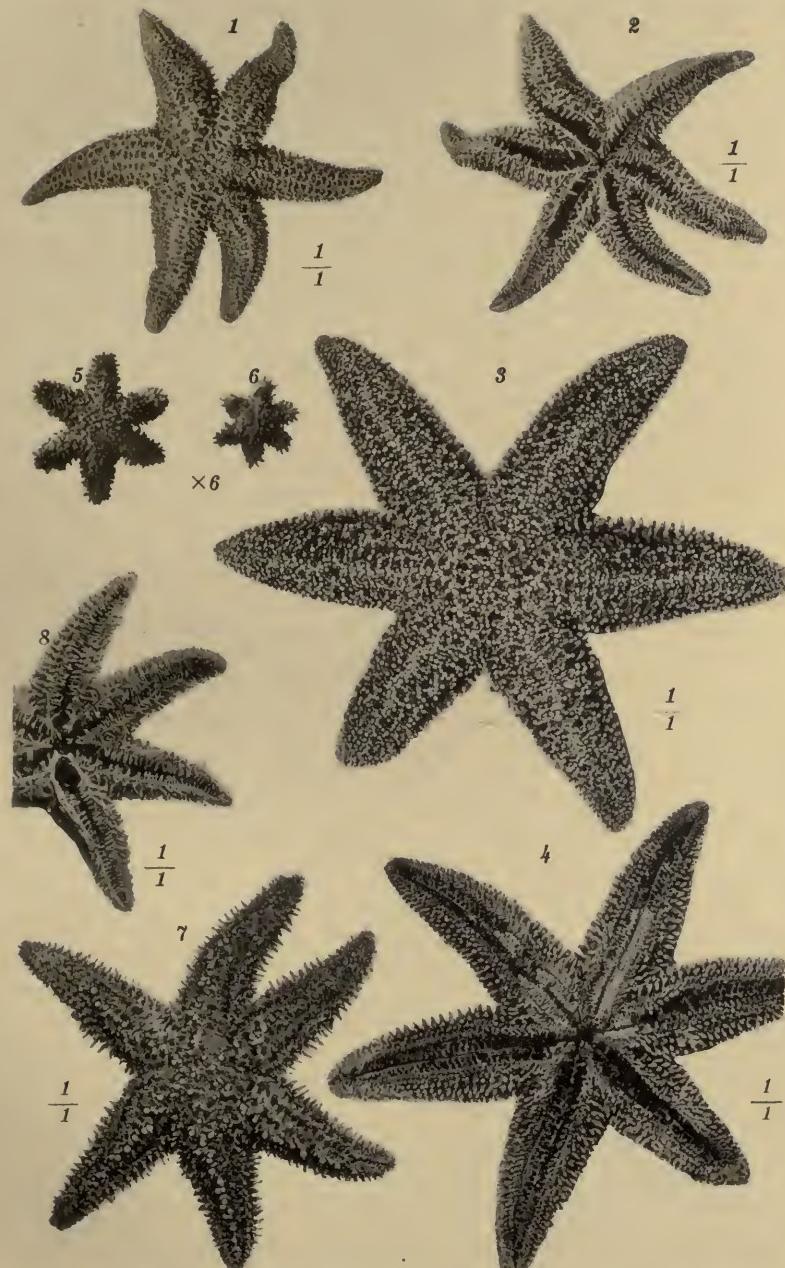
$\times 3$



1, 2. SOLASTER STIMPSONI Verrill. Type. No. 5407, Yale Mus.

PLATE XVI.

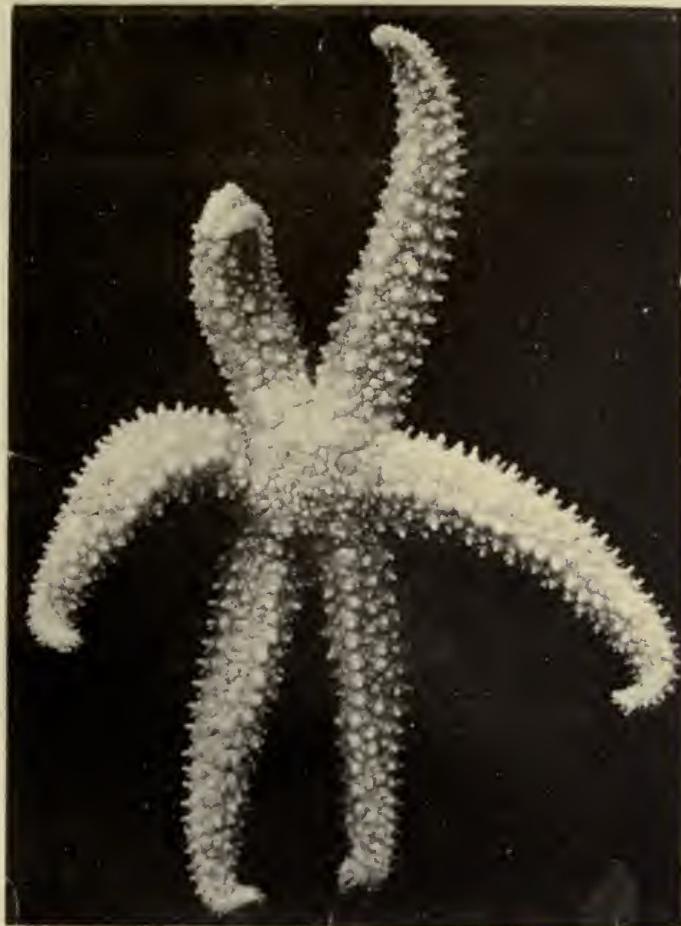
- FIG. 1. *Leptasterias epichlora alaskensis*, var. *carinella* Verrill. Young. Dorsal side; natural size.
- FIG. 2. The same specimen. Actinal side; natural size. Yale Mus.
- FIG. 3. The same, var. *siderea* Verrill. Type. Dorsal side; about natural size.
- FIG. 4. The same specimen. Actinal side; about natural size. Yale Mus.
- Figs. 5-6. The same. Very young stages; much enlarged (\times about 6). Yale Mus.
- FIG. 7. *Leptasterias dispar* Verrill. Type. Dorsal side; about natural size. Yale Mus.
- FIG. 8. *Leptasterias aequalis* (Stimpson), var. Ventral side; about natural size.



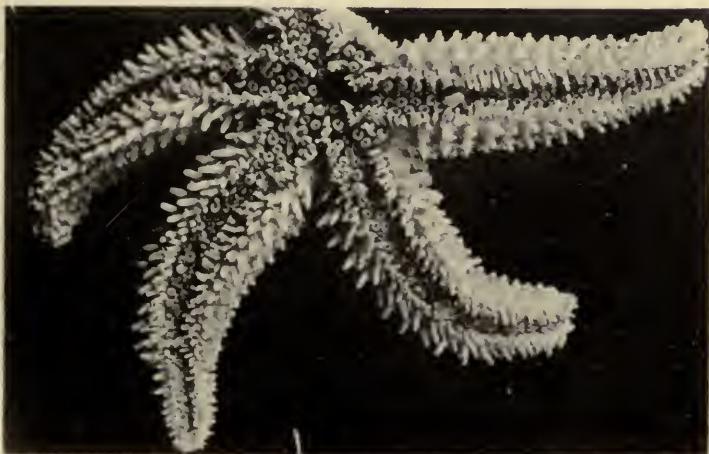
1, 2. *LEPTASTERIAS EPICHLORA ALASKENSIS*, var. *CARINELLA* Verrill
 3-6. The same, var. *SIDEREA* Verrill. Type
 7. *LEPTASTERIAS DISPAR* Verrill. Type
 8. *LEPTASTERIAS AEQUALIS* (Stimpson), var.

PLATE XVII.

- FIG. 1. *Leptasterias coei* Verrill. Type. In alcohol. Dorsal side; $\times 2\frac{1}{4}$.
Berg Bay. Yale Mus.
- FIG. 2. The same. Cotype. Specimen with shorter rays from Berg Bay.
Actinal view; $\times 2\frac{1}{4}$. Yale Mus.



2



1, 2. *LEPTASTERIAS COEI* Verrill. Type. Berg Bay. Yale Mus.

PLATE XVIII.

- FIG. 1. *Leptasterias aequalis* (Stimpson). Typical form, from Monterey Bay.
Actinal side; $\times 1\frac{1}{3}$.
- FIG. 2. The same specimen. Dorsal side; $\times 1\frac{1}{3}$.
- FIG. 3. *Leptasterias leptalea* Verrill. Type. Ventral side; $\times 1\frac{1}{3}$. Sitka.
Yale Mus.
- FIG. 4. *Orthasterias merriami* Verrill, sp. nov. Type. Dorsal side; about
natural size.
- FIG. 5. The same specimen. Details. Actinal side; natural size. Juneau.
Univ. of Calif.

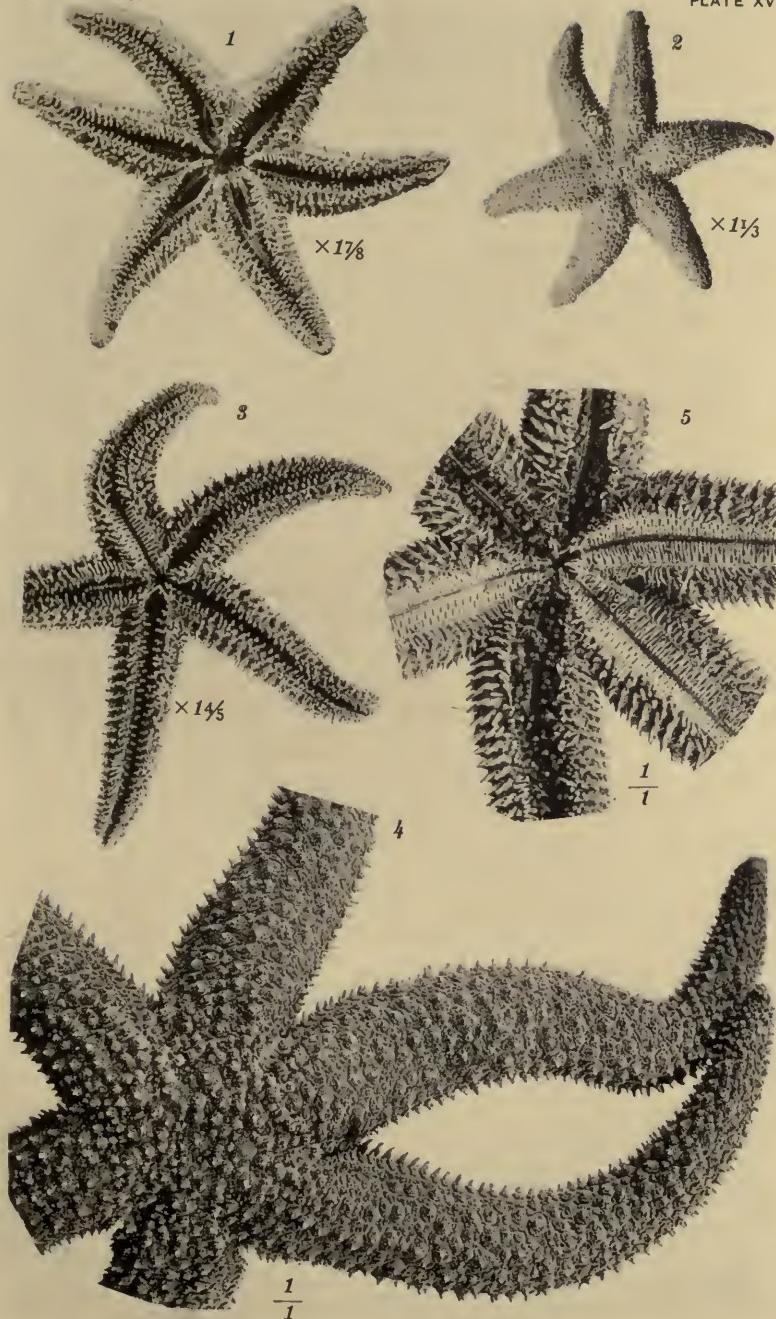
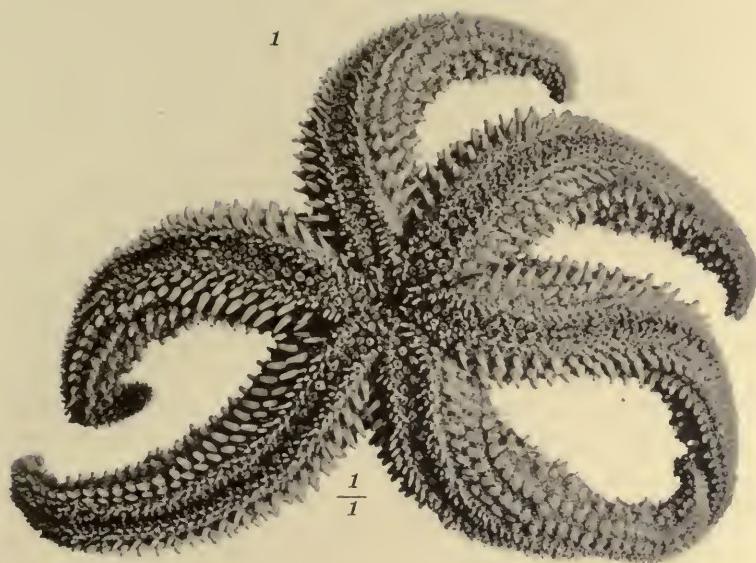
1, 2. *LEPTASTERIAS ÆQUALIS* (Stimpson)3. *LEPTASTERIAS LEPTALEA* Verrill. Type4, 5. *ORTHASTERIAS MERRIAMI* Verrill. Type

PLATE XIX.

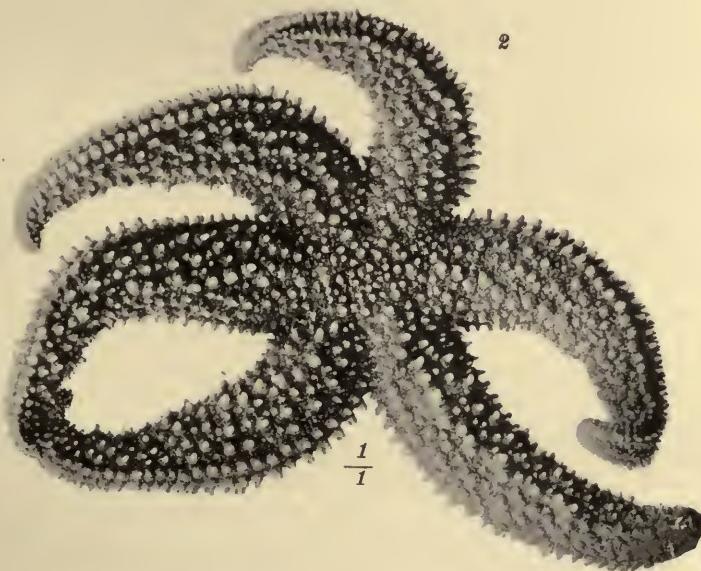
FIG. 1. *Orthasterias merriami* Verrill. Type. In alcohol. Actinal side;
natural size. Glacier Bay.

FIG. 2. The same specimen. Dorsal side. Yale Mus.

1



2

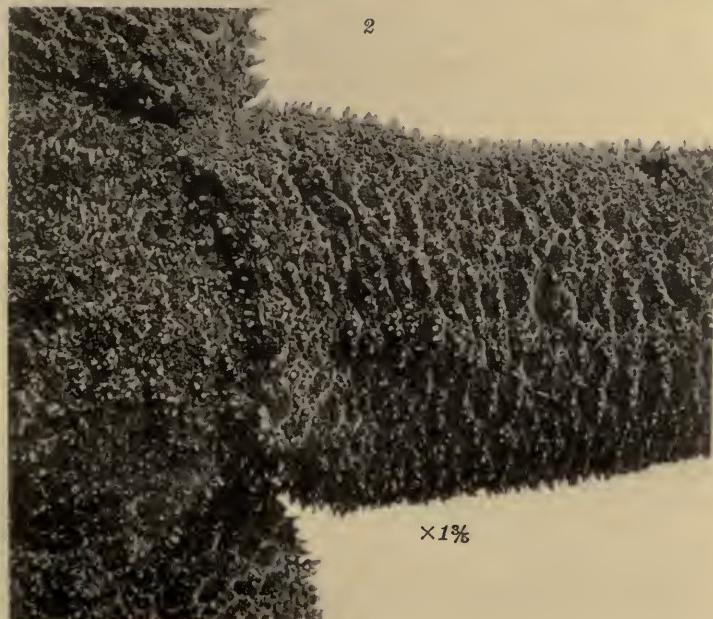
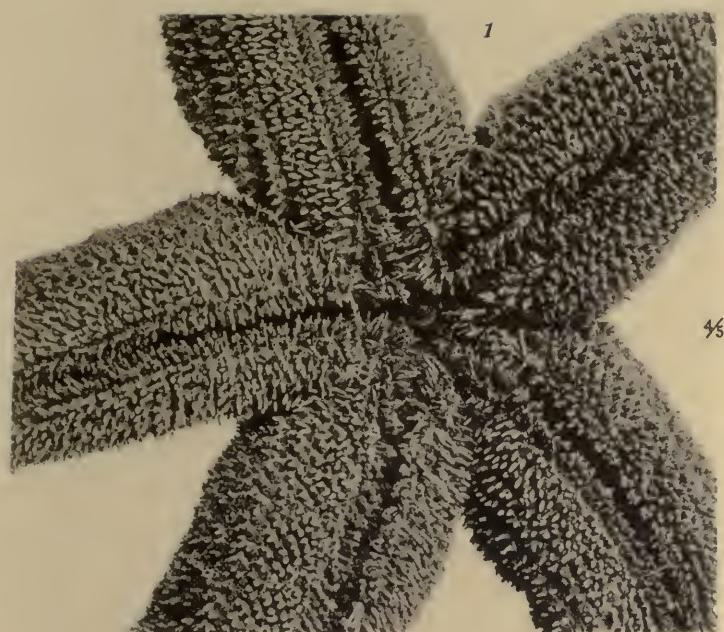


I, 2. *ORTHASTERIAS MERRIAMI* Verrill. Cotype

PLATE XX.

- FIG. 1. *Evasterias acanthostoma* Verrill. Type. Actinal side; $\frac{4}{5}$ natural size.
FIG. 2. The same specimen. Portion of dorsal side; $\times 1\frac{3}{4}$. Popof Is.,
Alaska. Professor Ritter. Univ. Calif.

(42)



I, 2. *EVASTERIAS ACANTHOSTOMA* Verrill. Type

PLATE XXI.

FIG. 1. *Pisaster ochraceus* (Brandt). Dorsal side; about $\frac{1}{2}$ natural size.
FIG. 2. The same. Actinal side; $\frac{1}{2}$ natural size.



1, 2. *PISASTER OCHRACEUS* (Brandt)

PLATE XXII.

FIG. 1. *Evasterias troschelii* (Stimpson). Typical form, in alcohol. Actinal side; $\times 1\frac{1}{3}$.

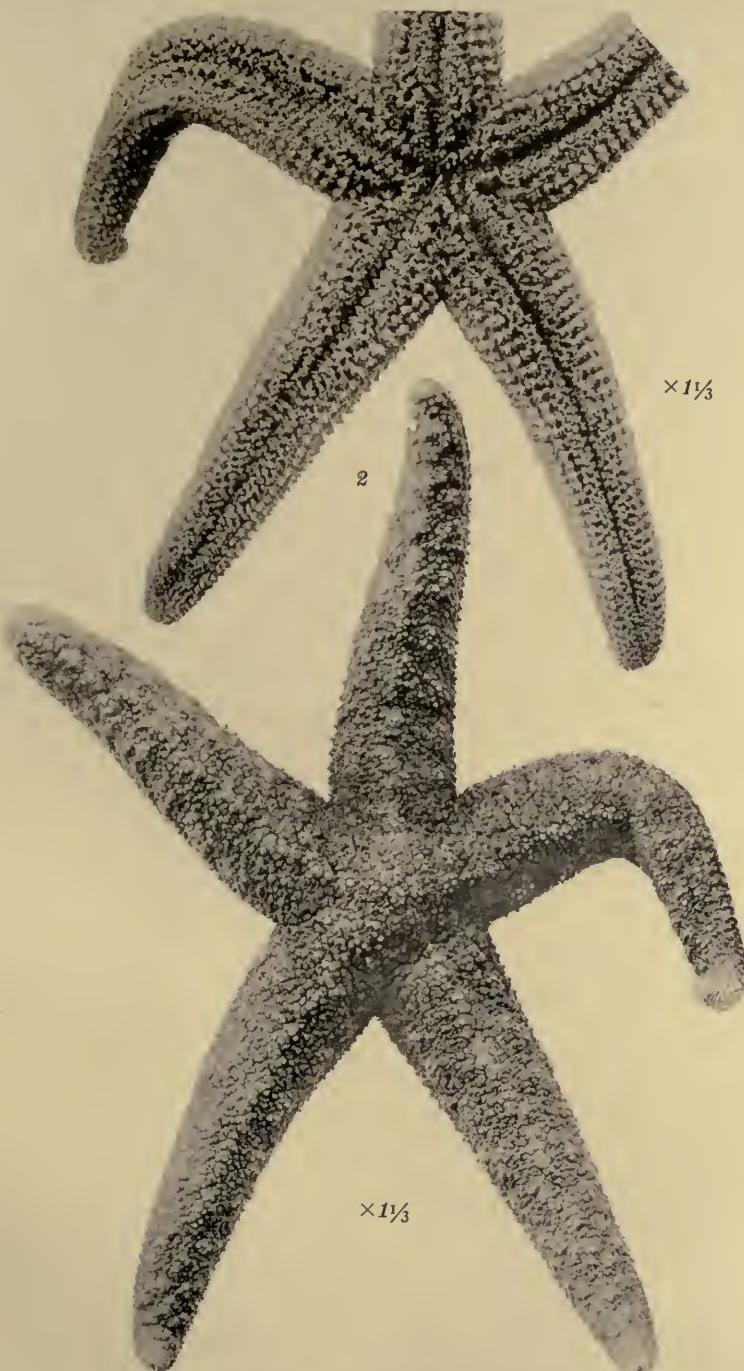
FIG. 2. The same specimen. Dorsal side; $\times 1\frac{1}{3}$. Sitka. Yale Mus.

1

$\times 1\frac{1}{3}$

2

$\times 1\frac{1}{3}$



1, 2. *EVASTERIAS TROSCHELII* (Stimpson)

PLATE XXIII.

FIG. 1. *Orthasterias dawsoni* Verrill. Type. Ventral side; $\frac{2}{3}$ natural size.

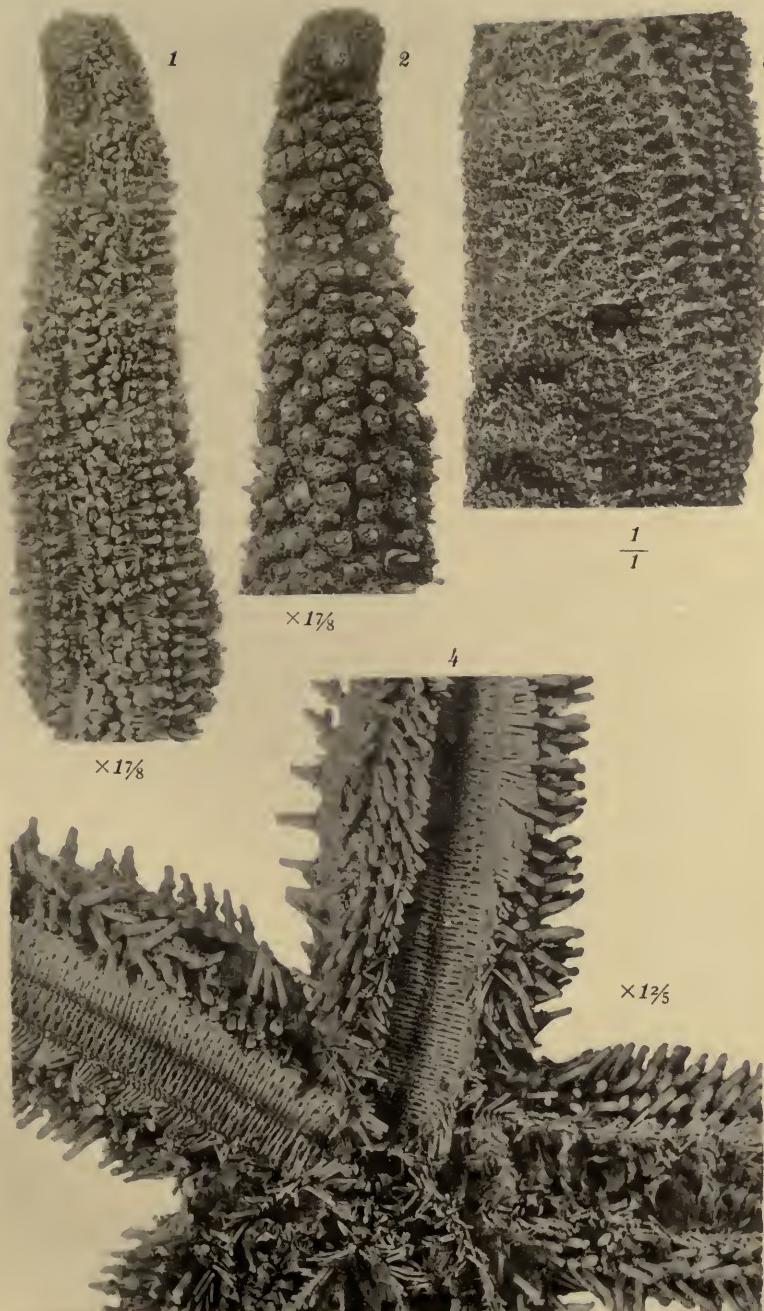
FIG. 2. The same specimen. Dorsal side; $\frac{7}{10}$ natural size. British Columbia,
Canadian Geol. Survey.



I, 2. *ORTHASTERIAS DAWSONI* Verrill. Type

PLATE XXIV.

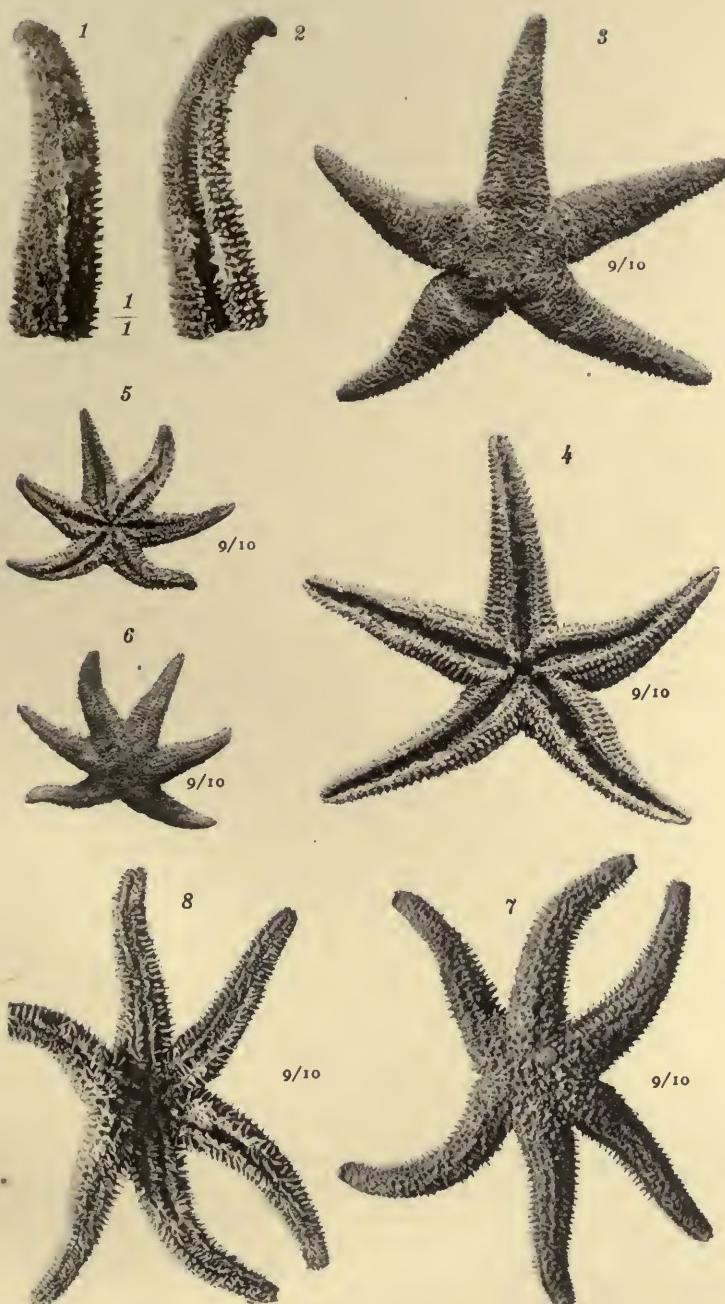
- FIG. 1. *Orthasterias columbiana* Verrill. Type. In alcohol. Actinal side of a ray; $\times 1\frac{1}{2}$.
- FIG. 2. The same specimen. Dorsal side of a ray; $\times 1\frac{1}{2}$. Yale Mus. Same specimen as pl. xix.
- FIG. 3. *Evaasterias acanthostoma* Verrill. Type. Part of a ray (dry), side view; about natural size. Univ. Calif.
- FIG. 4. *Orthasterias columbiana* Verrill. Details of actinal side; $\times 1\frac{1}{2}$. Yakutat, Alaska. Yale Mus.



1, 2. *ORTHASTERIAS COLUMBIANA* Verrill. Type
3. *EVASTERIAS ACANTHOSTOMA* Verrill. Type
4. *ORTHASTERIAS COLUMBIANA* Verrill

PLATE XXV.

- FIG. 1. *Evasterias troschelii*. Type of Stimpson. Part of a ray, dorsal side; about 9/10 natural size.
- FIG. 2. The same specimen. Ventral side. U. S. Nat. Mus.
- FIGS. 3, 4. *Ctenasterias cribaria* (Stimpson). Type of Stimpson. Dorsal and ventral sides; about 9/10 natural size.
- FIGS. 5, 6. *Leptasterias aequalis* (Stimpson). Type of Stimpson. Ventral side; about 9/10 natural size. U. S. Nat. Mus.
- FIGS. 7, 8. *Leptasterias hexactis* (Stimpson). Type of Stimpson. Ventral side; about 9/10 natural size. U. S. Nat. Mus.

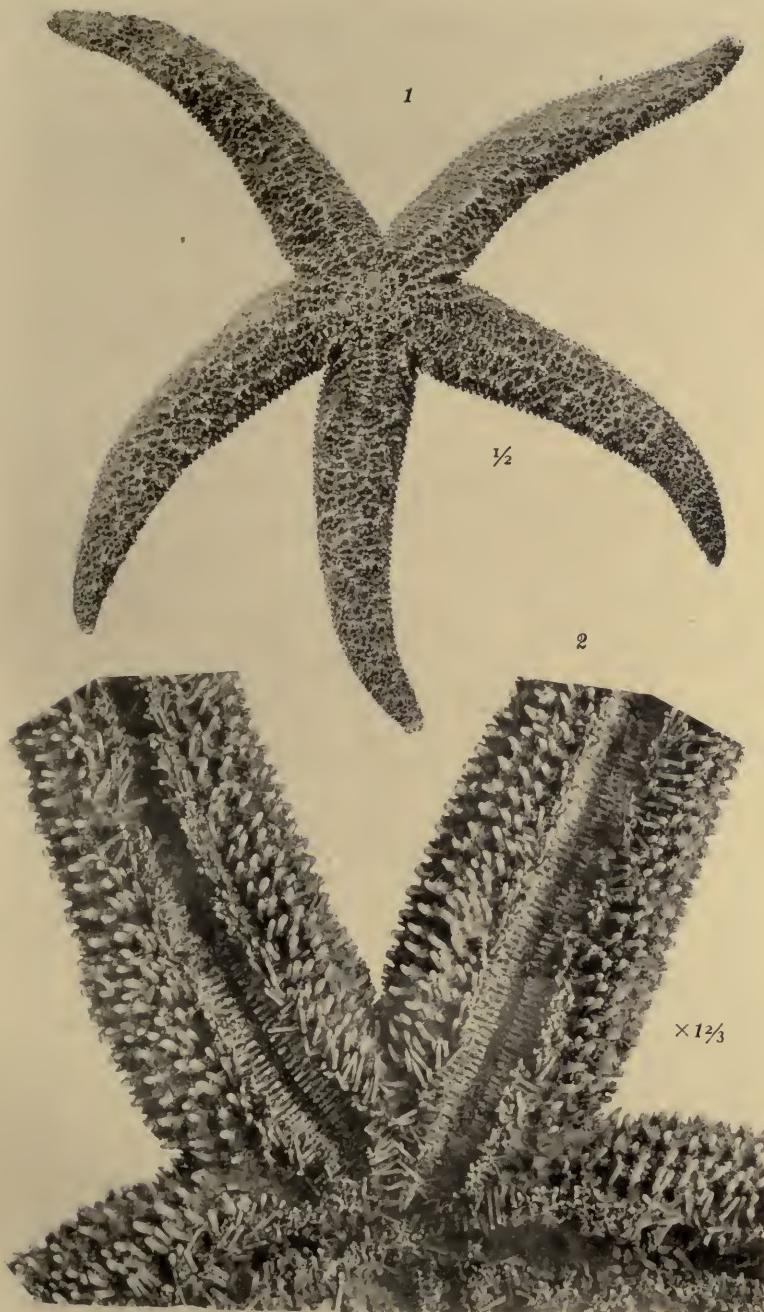


I, 2. *EVASTERIAS TROSCHELII* (Stimpson). Type of Stimpson
 3, 4. *CTENASTERIAS CRIBRARIA* (Stimpson). Type of Stimpson
 5, 6. *LEPTASTERIAS ÆQUALIS* (Stimpson). Type of Stimpson
 7, 8. *LEPTASTERIAS HEXACTIS* (Stimpson). Type of Stimpson

PLATE XXVI.

FIG. 1. *Evaasterias troschelii* Stimpson. Typical form from Sitka. Dorsal side; about $\frac{1}{2}$ natural size.

FIG. 2. The same specimen. Details of actinal side; $\times 1\frac{3}{4}$. Yakutat. Yale Mus.



I. 2. *EVASTERIAS TROSCHELII* (Stimpson)

PLATE XXVII.

FIG. 1. *Asterias acervata* Stimpson. Type. Dorsal side; about $\frac{4}{5}$ natural size.
U. S. Nat. Mus.

FIG. 2. The same specimen. Ventral side; about $\frac{4}{5}$ natural size.

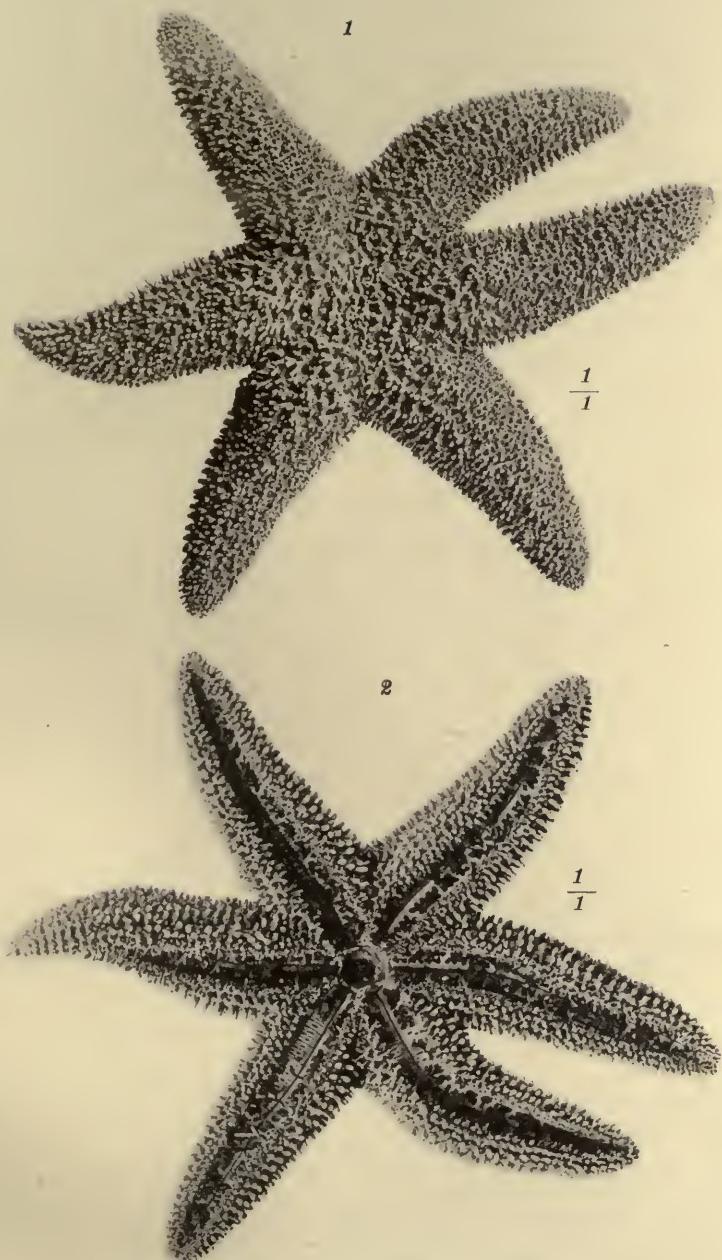


I. *ASTERIAS ACERVATA* Stimpson. Type

PLATE XXVIII.

FIG. 1. *Leptasterias epichlora alaskensis* Verrill. Type. Dorsal side; natural size.

FIG. 2. The same specimen. Ventral side; natural size. Yale Mus.

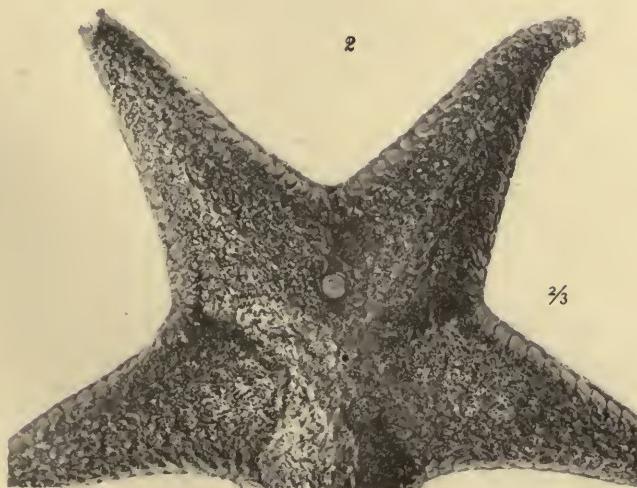
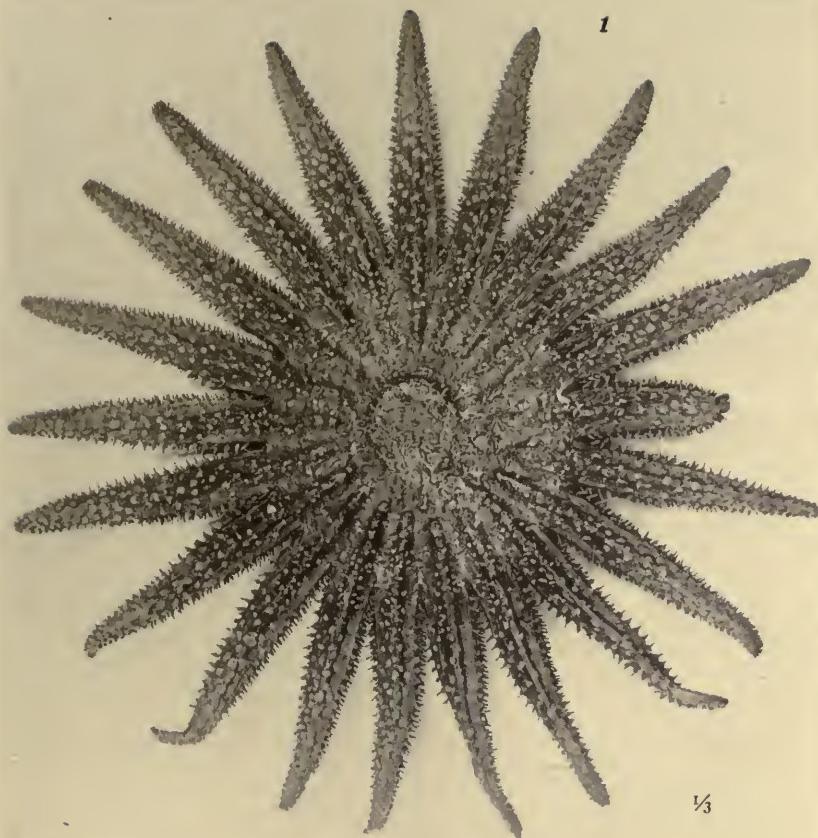


1, 2. *LEPTASTERIAS EPICHLORA ALASKENSIS* Verrill. Type

PLATE XXIX.

FIG. 1. *Pycnopodia helianthoides* (Brandt) Stimpson. Actinal side; about $\frac{1}{3}$ natural size. Yale Mus.

FIG. 2. *Dermasterias imbricata* (Grube) Perrier. Dorsal side; $\frac{2}{3}$ natural size. Yale Mus.



1. PYCNOPODIA HELIANTHOIDES (Brandt)
2. DERMASTERIAS IMBRICATA (Grube)

PLATE XXX.

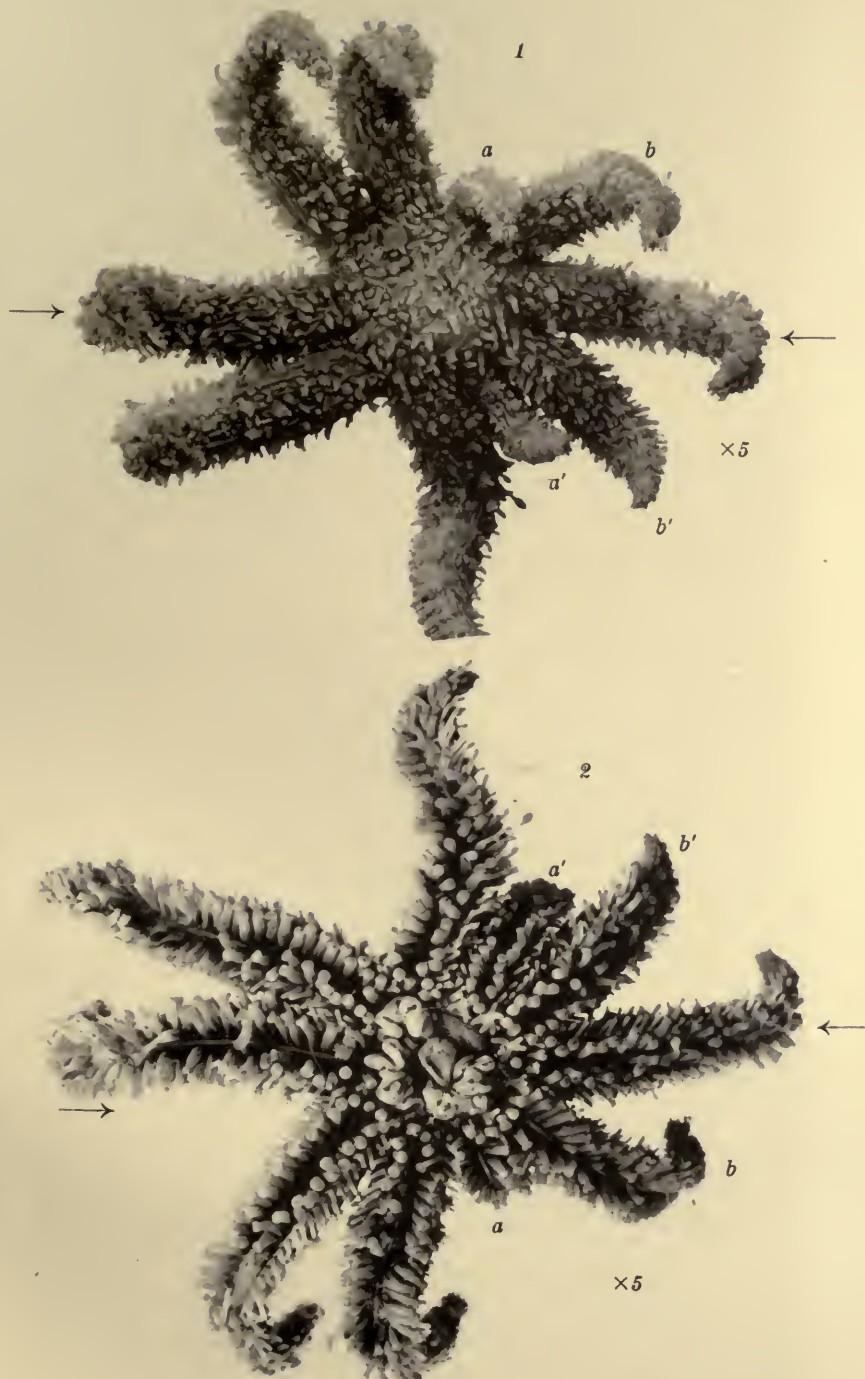
FIG. 1. *Pycnopodia helianthoides* (Brandt) Stimpson. Same specimen as pl. XXIX, fig. 1. Details of dorsal side; $\times 2\frac{1}{2}$.



PYCNOPODIA HELIANTHOIDES (Brandt)

PLATE XXXI.

- FIG. 1. *Pycnopodia helianthoides* (Brandt). Young, in alcohol. Dorsal side;
X about 5.
- FIG. 2. The same specimen. Actinal side. These figures show the inter-
budding of new rays, symmetrically to a median plane indicated
by the arrows; *a, a'*, last-formed rays; *b, b'*, previous or first pair
of interpolated rays, one on either side of a primary odd ray.

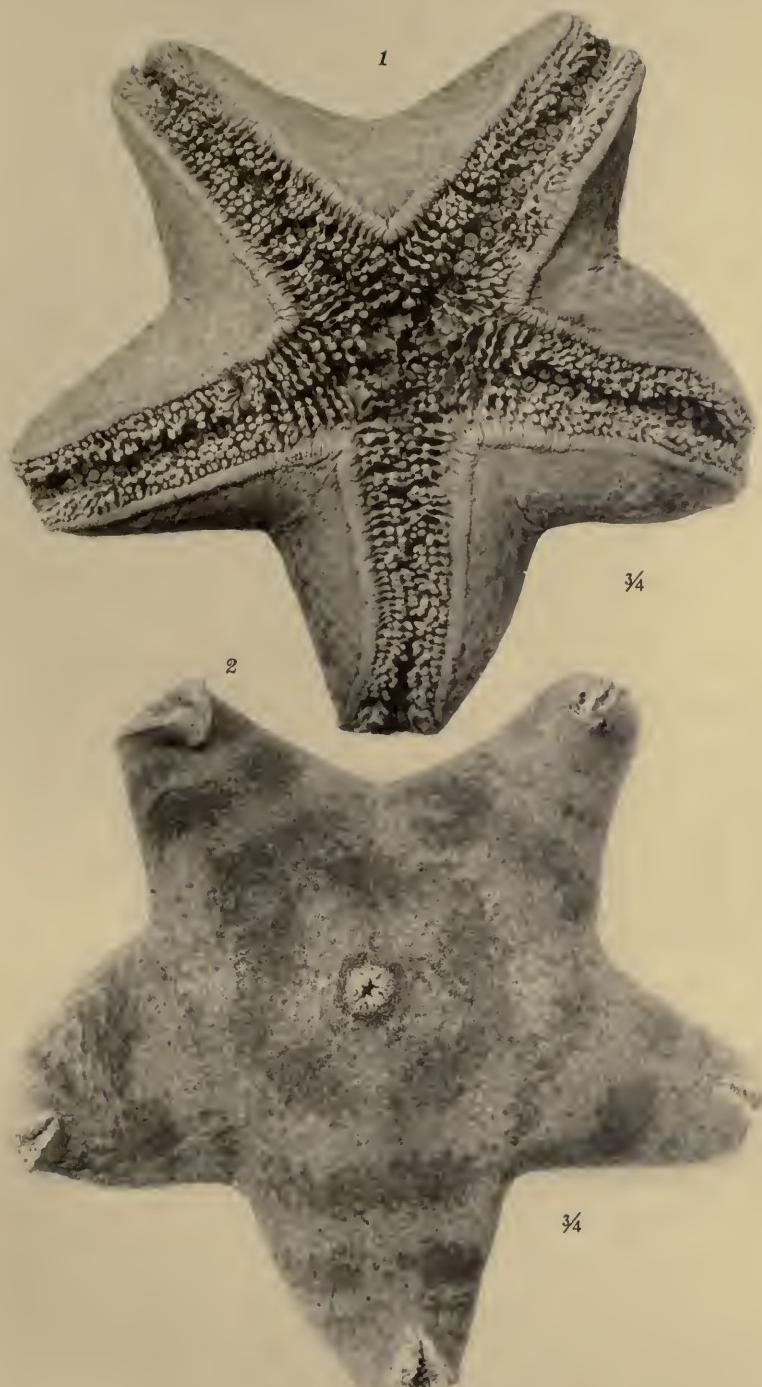


1, 2. PYCNOPODIA HELIANTHOIDES (Brandt). Young, in alcohol

PLATE XXXII.

FIG. 1. *Pteraster tesselatus* Ives. Ventral side of an alcoholic specimen;
about $\frac{3}{4}$ natural size.

FIG. 2. The same specimen. Dorsal side. Yale Mus.



PTERASTER TESSELATUS Ives

PLATE XXXIII.

FIG. 1. *Luidiaster dawsoni* (Verrill) Ludwig. Type. Dorsal side; about $\frac{3}{4}$ natural size. Canadian Geol. Survey.



LUIDIASTER DAWSONI (Verrill) Ludwig. Type

PLATE XXXIV.

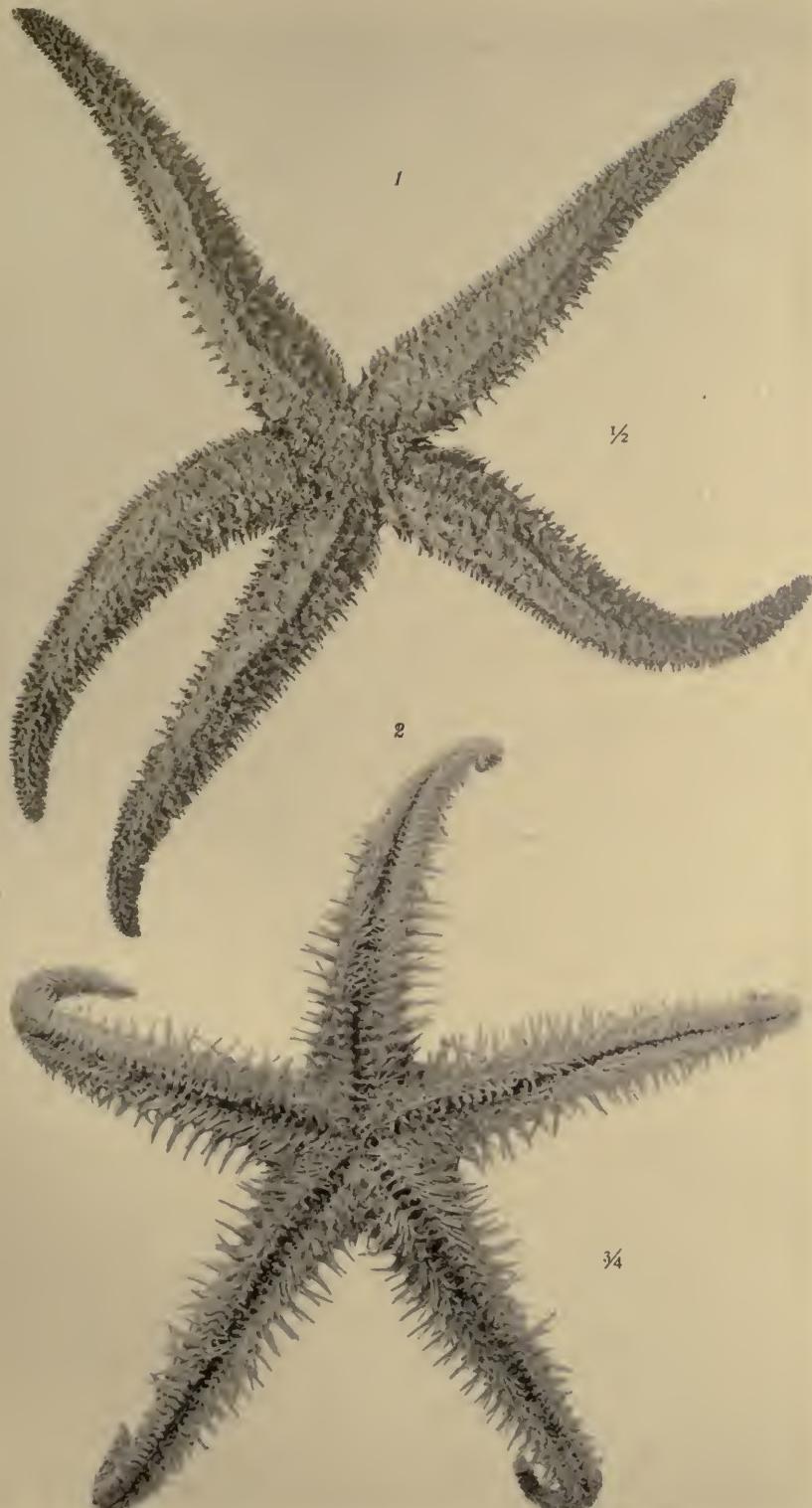
FIG. I. The same specimen as pl. XXXIII. Details of lower side of disk;
P, P, P, pectinate or fasciolated pedicellariæ; \times about 6.



LUIDIASTER DAWSONI (Verrill) Ludwig. Type. Details

PLATE XXXV.

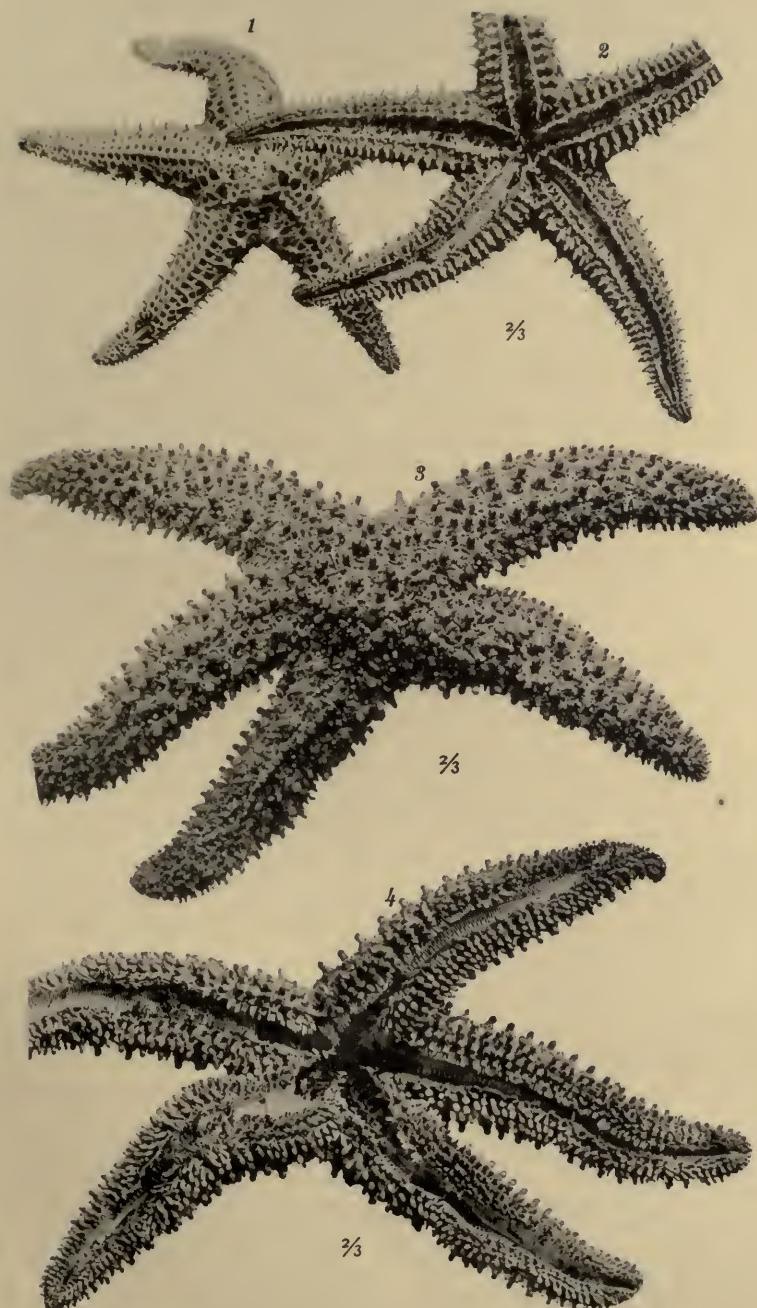
- FIG. 1. *Orthasterias columbiana* Verrill. Type. Same specimen as pl. xxiv,
fig. 4. Dorsal side; $\frac{1}{2}$ natural size. Yakutat. Yale Mus.
- FIG. 2. *Luidiaster dawsoni* (Verrill) Ludwig. Type. Same specimen as pls.
xxxiii and xxxiv. About $\frac{3}{4}$ natural size. Geol. Surv. Canada.



1. *ORTHASTERIAS COLUMBIANA* Verrill. Cotype
2. *LUDIASTER DAWSONI* (Verrill) Ludwig. Type

PLATE XXXVI.

- FIG. 1. *Pisaster paucispinus* (Stimpson) Verrill. Type of Stimpson. Dorsal view; about $\frac{2}{3}$ natural size.
- FIG. 2. The same. Actinal view; about $\frac{2}{3}$ natural size. U. S. Nat. Mus.
- FIG. 3. *Pisaster capitatus* (Stimpson) Verrill. Type of Stimpson. Dorsal view; $\frac{2}{3}$ natural size.
- FIG. 4. The same specimen. Actinal view; $\frac{2}{3}$ natural size.



1, 2. *PISASTER PAUCISPINUS* (Stimpson) Verrill. Type of Stimpson
3, 4. *PISASTER CAPITATUS* (Stimpson) Verrill. Type of Stimpson

PLATE XXXVII.

FIG. 1. *Pisaster giganteus* (Stimpson) Verrill. Type of Stimpson. Dorsal view; about $\frac{1}{5}$ natural size.

FIG. 2. The same specimen. Actinal view. U. S. Nat. Mus.

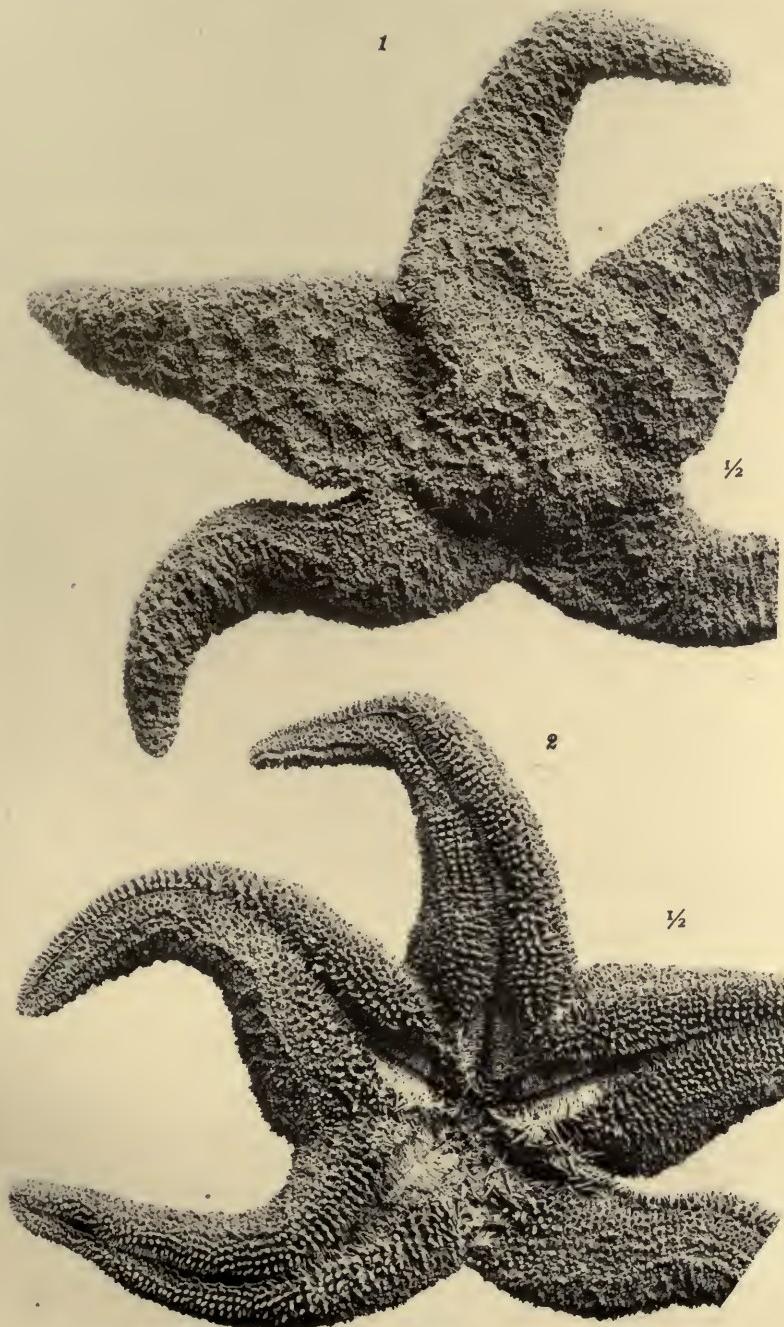


1, 2. *PISASTER GIGANTEUS* (Stimpson) Verrill. Type of Stimpson

PLATE XXXVIII.

FIG. 1. *Pisaster confertus* (Stimpson) Verrill. Type. Dorsal view; about $\frac{1}{2}$ natural size.

FIG. 2. The same specimen. Actinal view. U. S. Nat. Mus.

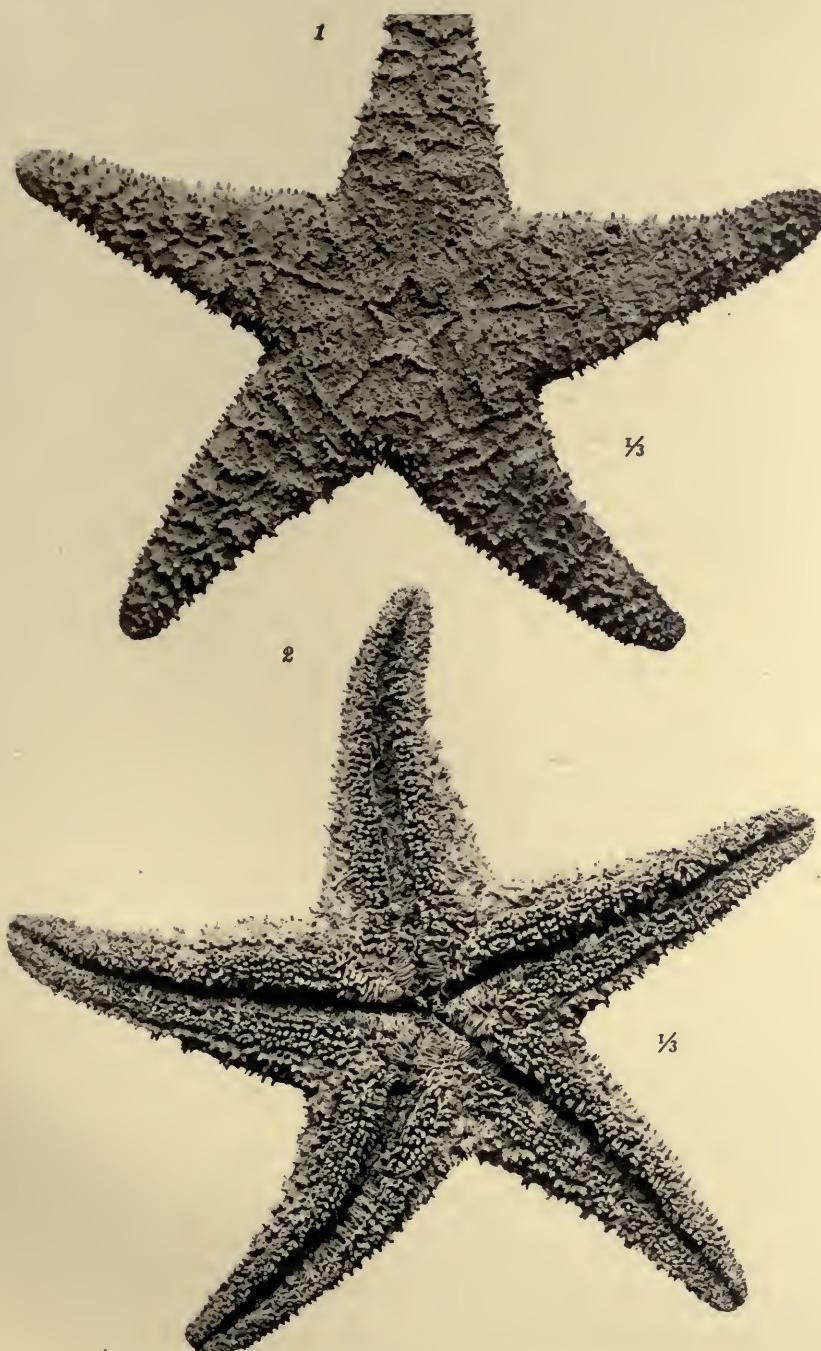


1, 2. *PISASTER CONFERTUS* (Stimpson) Verrill. Type

PLATE XXXIX.

FIG. 1. *Pisaster fissispinus* (Stimpson) Verrill. Type. Dorsal view; about $\frac{1}{3}$ natural size.

FIG. 2. The same specimen. Actinal view. U. S. Nat. Mus.

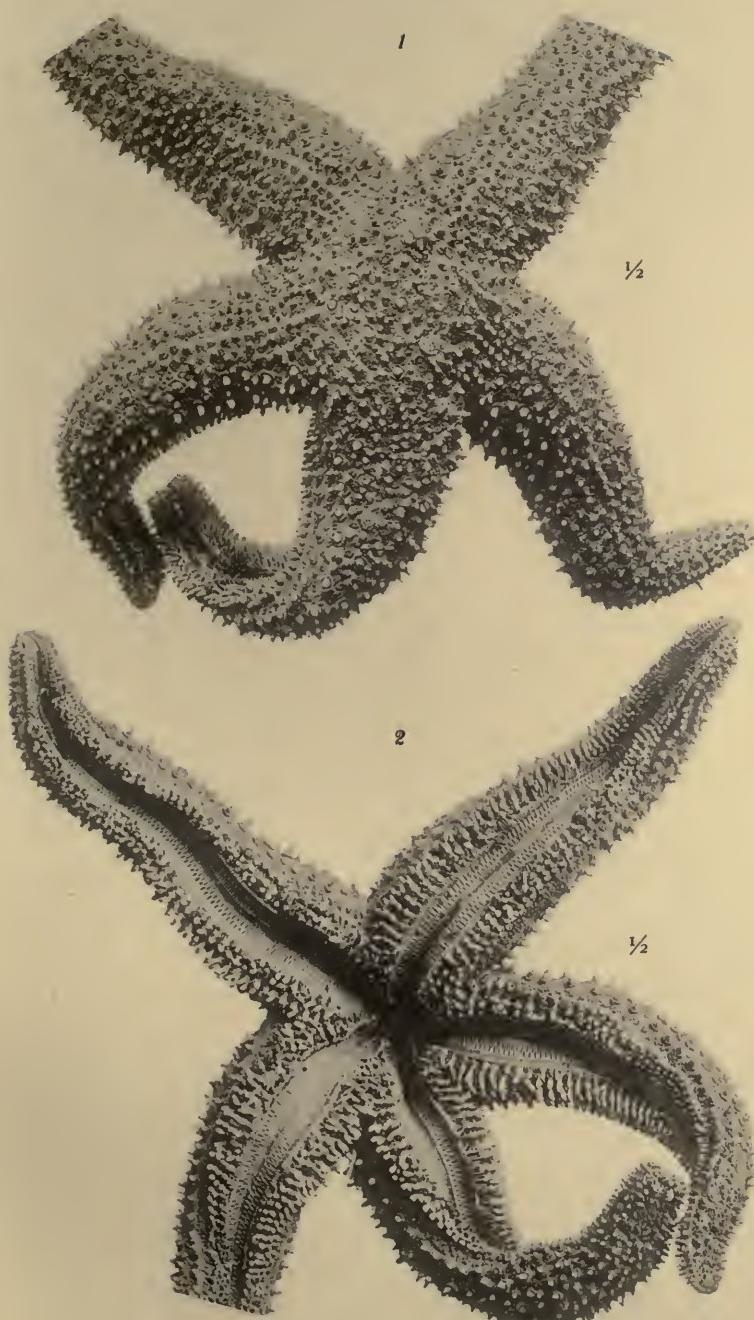


1, 2. *PISASTER FISSISPINUS* (Stimpson) Verrill. Type

PLATE XL.

FIG. 1. *Pisaster lütkenii* (Stimpson) Verrill. Type. Dorsal view; about $\frac{1}{2}$ natural size.

FIG. 2. The same specimen. Actinal view. U. S. Nat. Mus.

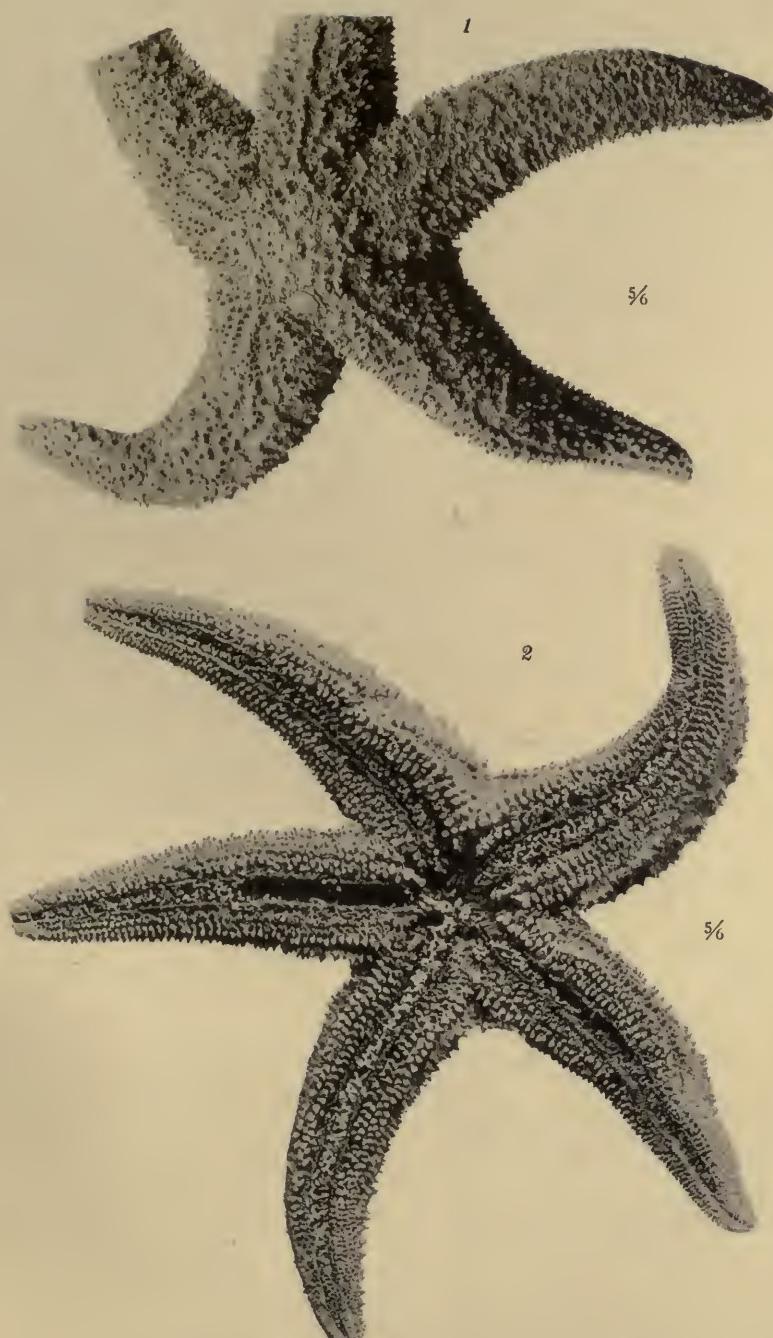


1, 2. *PISASTER LÜTKENII* (Stimpson) Verrill. Type

PLATE XLI.

FIG. 1. *Pisaster brevispinus* (Stimpson) Verrill. Type. Dorsal view; about $\frac{5}{6}$ natural size. U. S. Nat. Mus.

FIG. 2. The same specimen. Actinal view; $\frac{5}{6}$ natural size.



1, 2. *PISASTER BREVISPINUS* (Stimpson) Verrill. Type

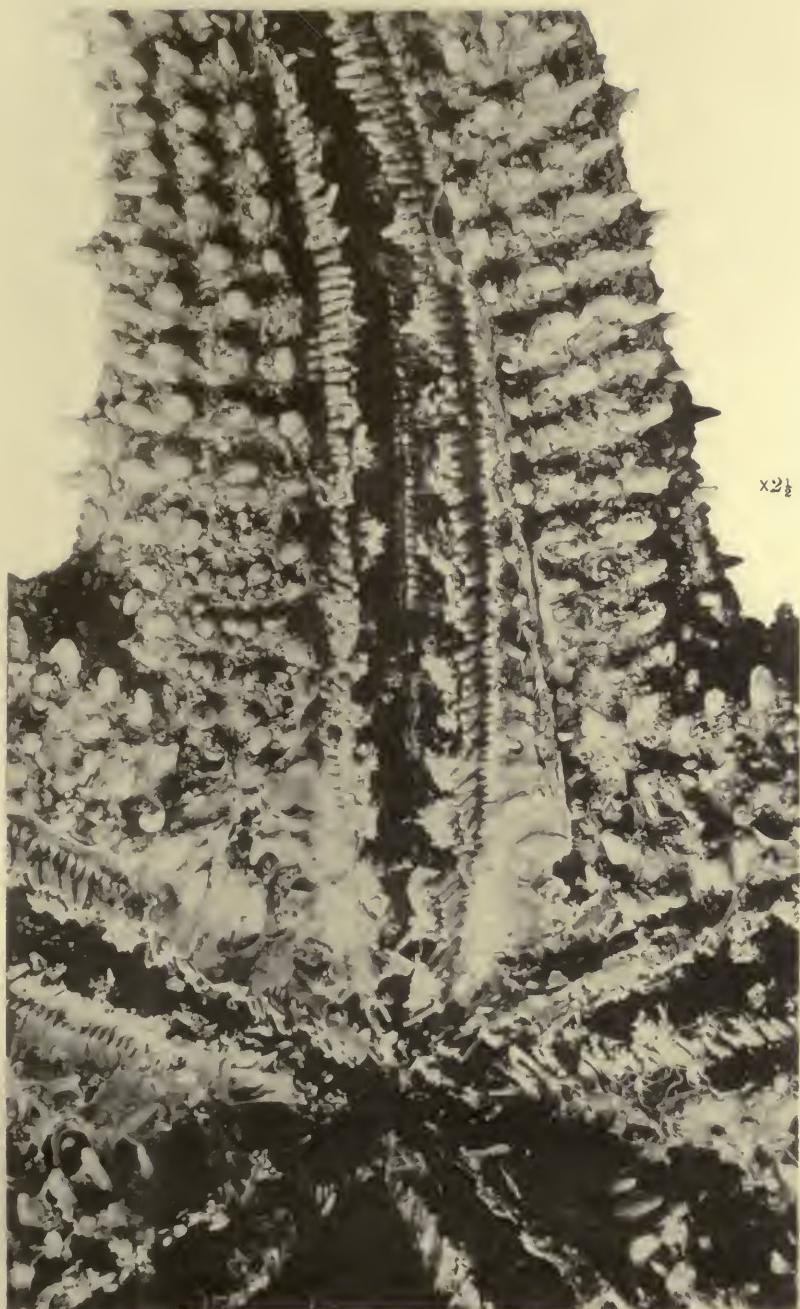
PLATE XLII.

Pisaster papulosus Verrill. Type. Dorsal view; about 7/10 natural size.



PLATE XLIII.

Pisaster papulosus Verrill. Actinal side of type; $\times 2\frac{1}{2}$.



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PISASTER PAPULOSUS VER. Type

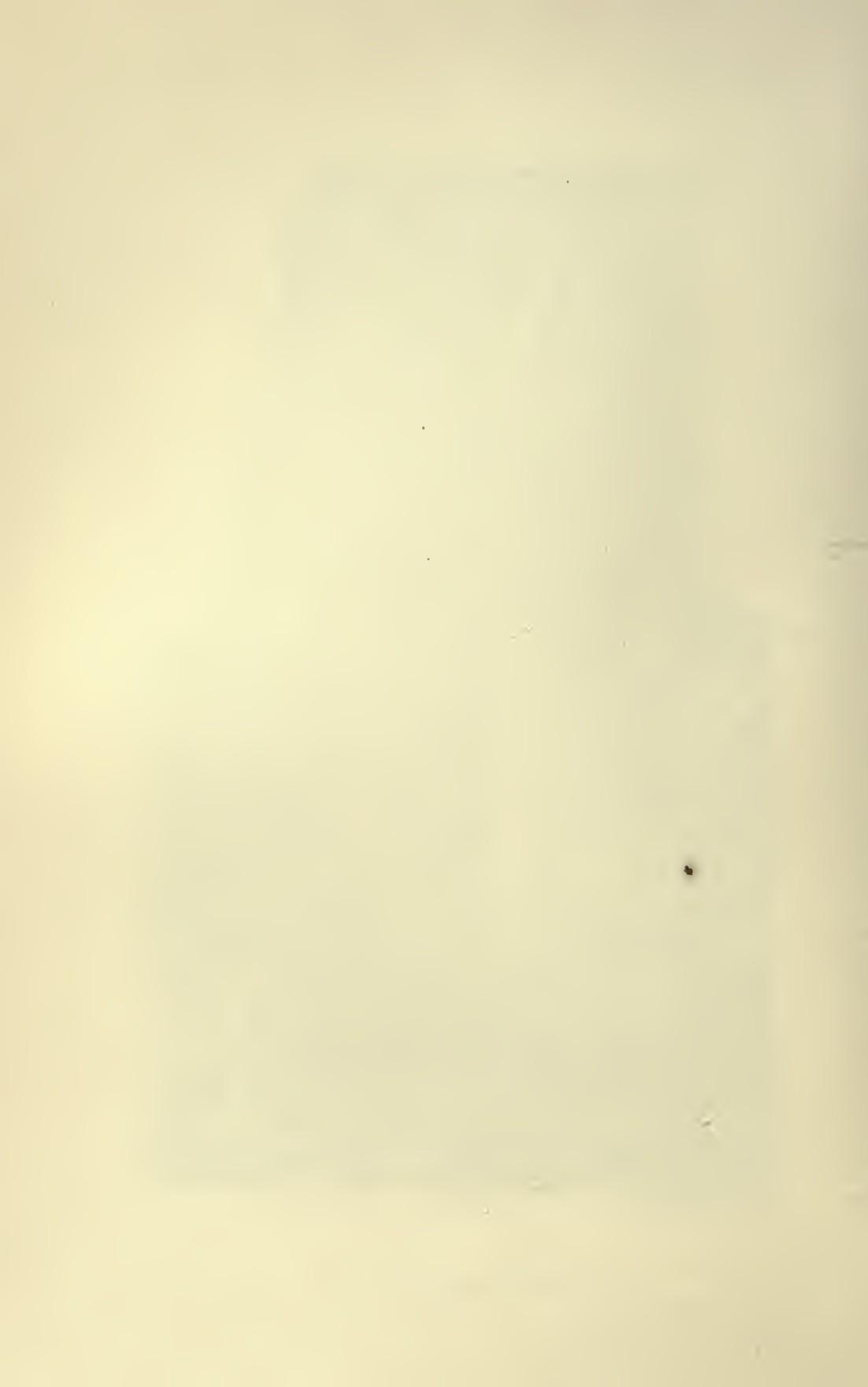
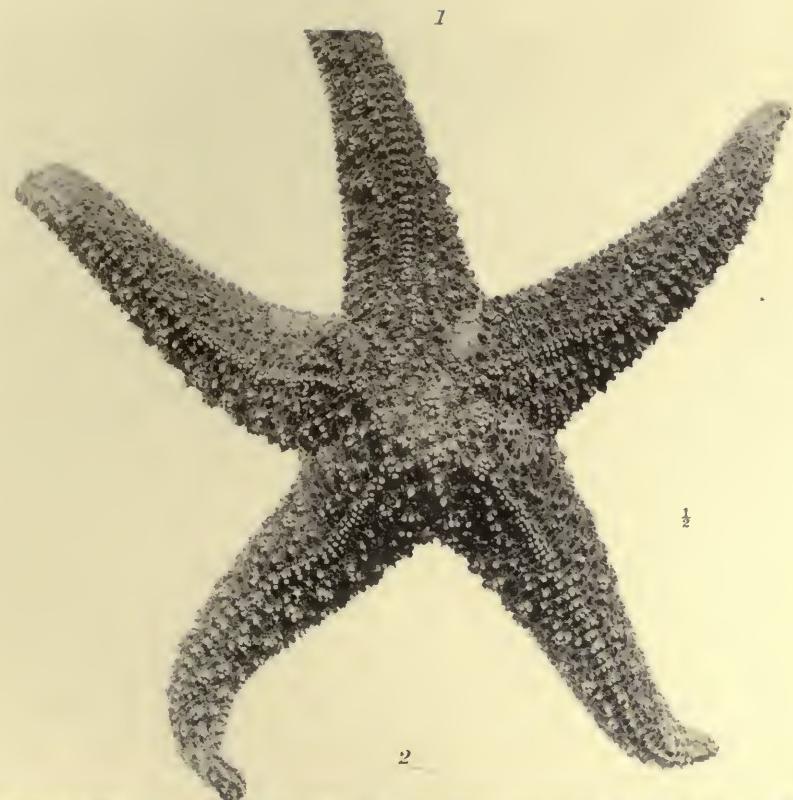


PLATE XLIV.

FIG. 1. *Pisaster brevispinus* (Stimpson) Verrill. Dorsal view; about $\frac{1}{2}$ natural size. No. 1820, Mus. Comp. Zoöl.

FIG. 2. The same specimen. Dorsal view of a part of the disk, including the madreporic plate; $\times 2\frac{1}{2}$.

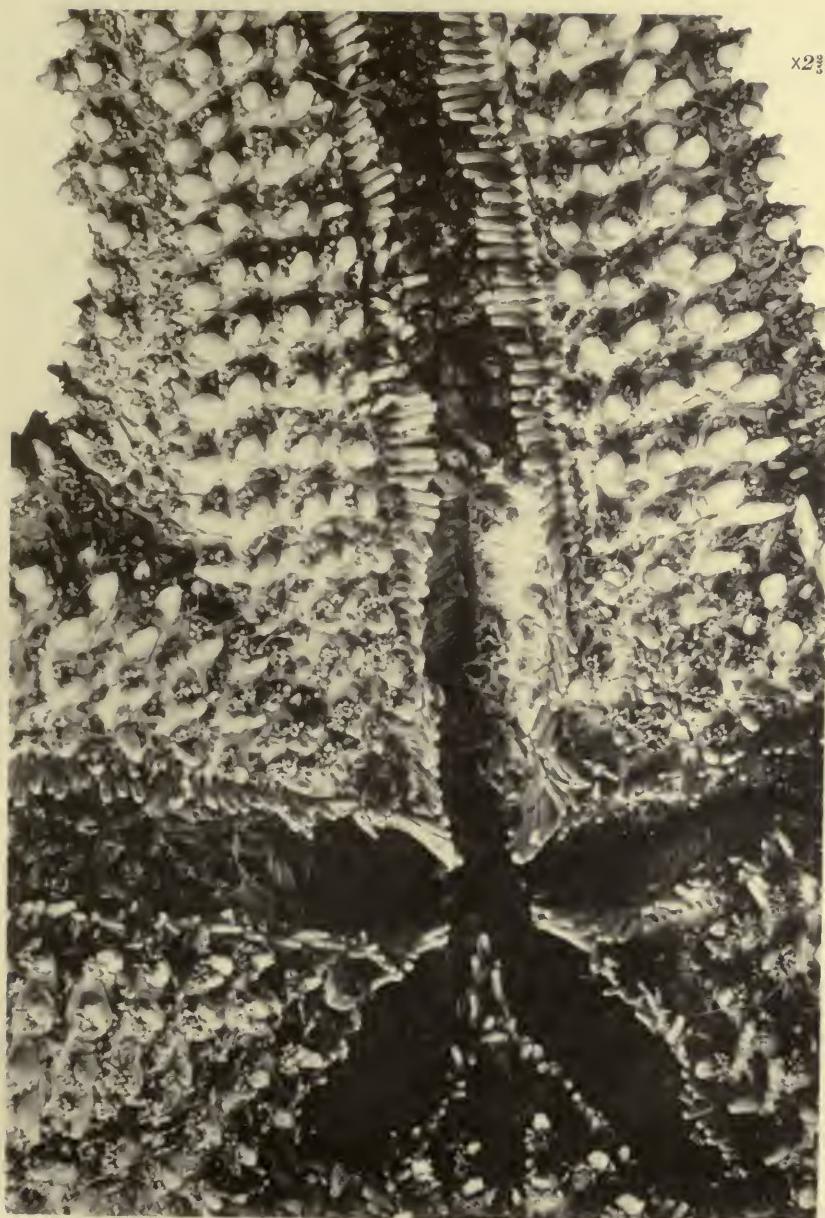


HELIOTYPE CO., BOSTON

1.2. *PISASTER BREVISPINUS* (ST.) VER.

PLATE XLV.

Pisaster brevispinus (Stimpson) Verrill. Actinal side; $\times 2\frac{1}{2}$. No. 1820, Mus.
Comp. Zoölogy.

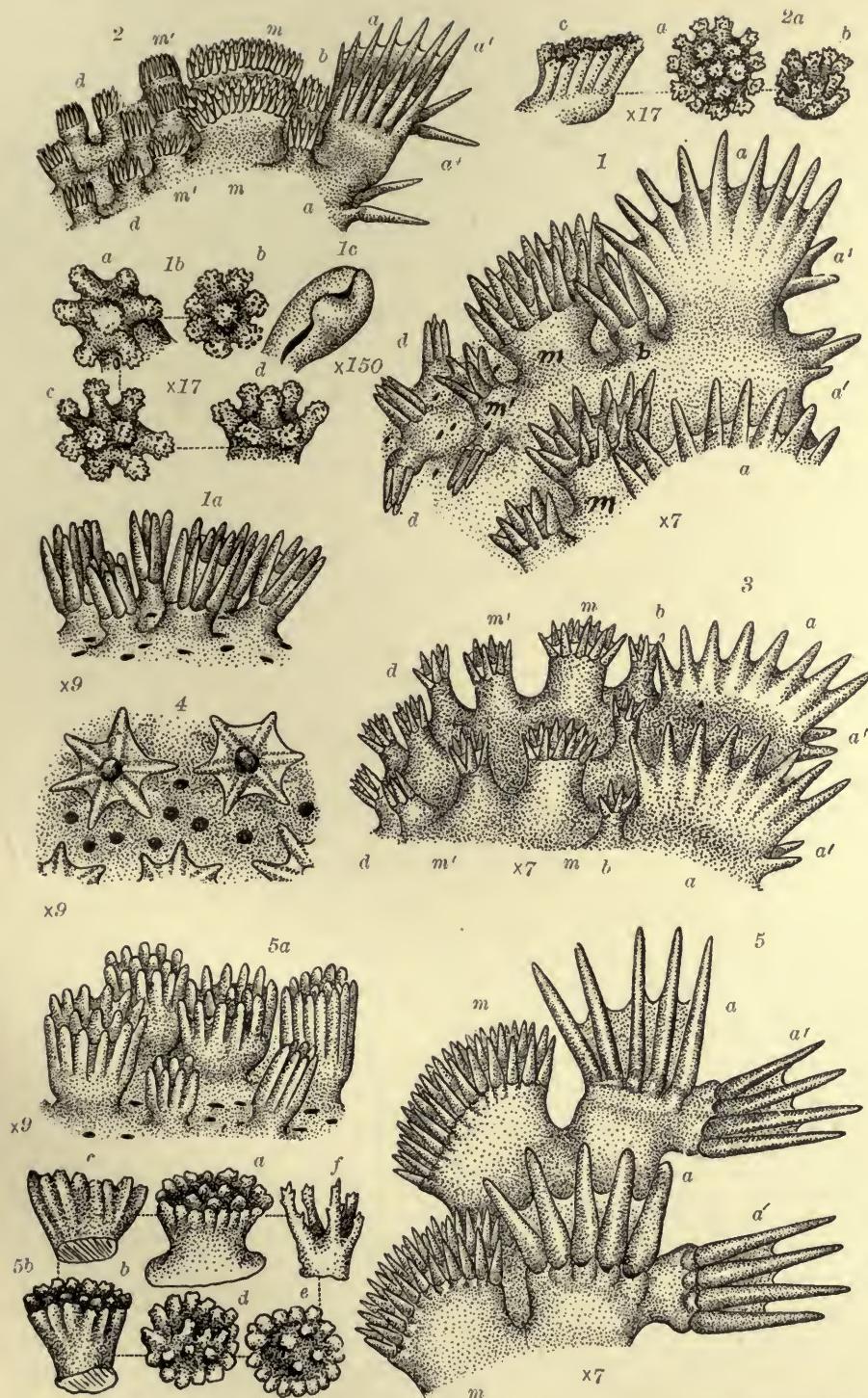


.. HELIOTYPE CO., BOSTON

PISASTER BREVISPINUS (St.) VER.

PLATE XLVI.

- FIG. 1. *Solaster stimpsoni* Verrill. Profile view of adambulacral, marginal, and adjacent spines; *a*, *a*, adambulacral spines, actinal series; *a'*, *a'*, furrow series; *b*, peractinals; *m*, *m*, inferomarginals; *m'*, supramarginals; *d*, dorso-lateral spines and plates.
- FIG. 1a. The same specimen. A group of dorsal pseudopaxillæ and papular pores; \times about 9.
- FIG. 1b. The same specimen. Dorsal pseudopaxillæ from base of ray, vertical and side views; \times 17.
- FIG. 1c. The same specimen. A dorsal, dermal, bivalve pedicellaria from near the edge of a papular pore; \times 150.
- FIG. 2. *Solaster galaxides* Verrill. Type. Profile view of actinal side; *a*, *a*, plates; \times about 7. Lettering as in fig. 1.
- FIG. 2a. The same. A group of dorsal pseudopaxillæ from another specimen; \times about 17. No. 1897, Mus. Comp. Zool.
- FIG. 3. *Solaster constellatus* Verrill. Type. \times about 7. Lettering as in fig. 1.
- FIG. 4. The same specimen. A group of dorsal pseudopaxillæ and papular pores, seen from above; \times about 9.
- FIG. 5. *Solaster dawsoni* Verrill. Type. Profile view of adambulacral and inferomarginal plates and spines from middle part of a ray. Lettering as in fig. 1.
- FIG. 5a. The same specimen. A group of dorsal pseudopaxillæ and papular pores; \times 9.
- FIG. 5b. The same. Dorsal pseudopaxillæ from the type specimen, vertical and side views; \times 17.



A. HYATT VERRILL DEL. X17

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1-1c. SOLASTER STIMPSONI VER. Details

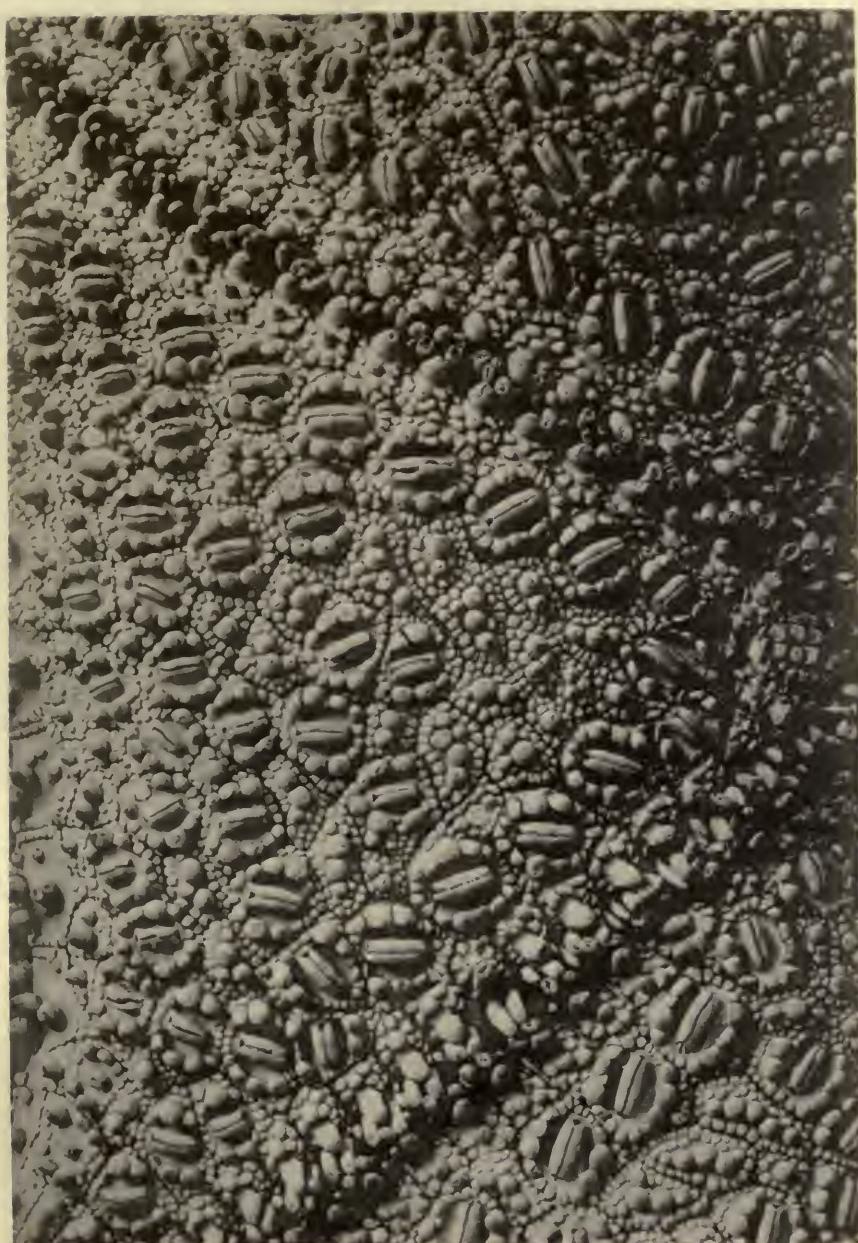
2-2a. S. GALAXIDES VER. Details. Type

3-4. S. CONSTELLATUS VER. Details. Type

5-5b. S. DAWSONI VER. Details

PLATE XLVII.

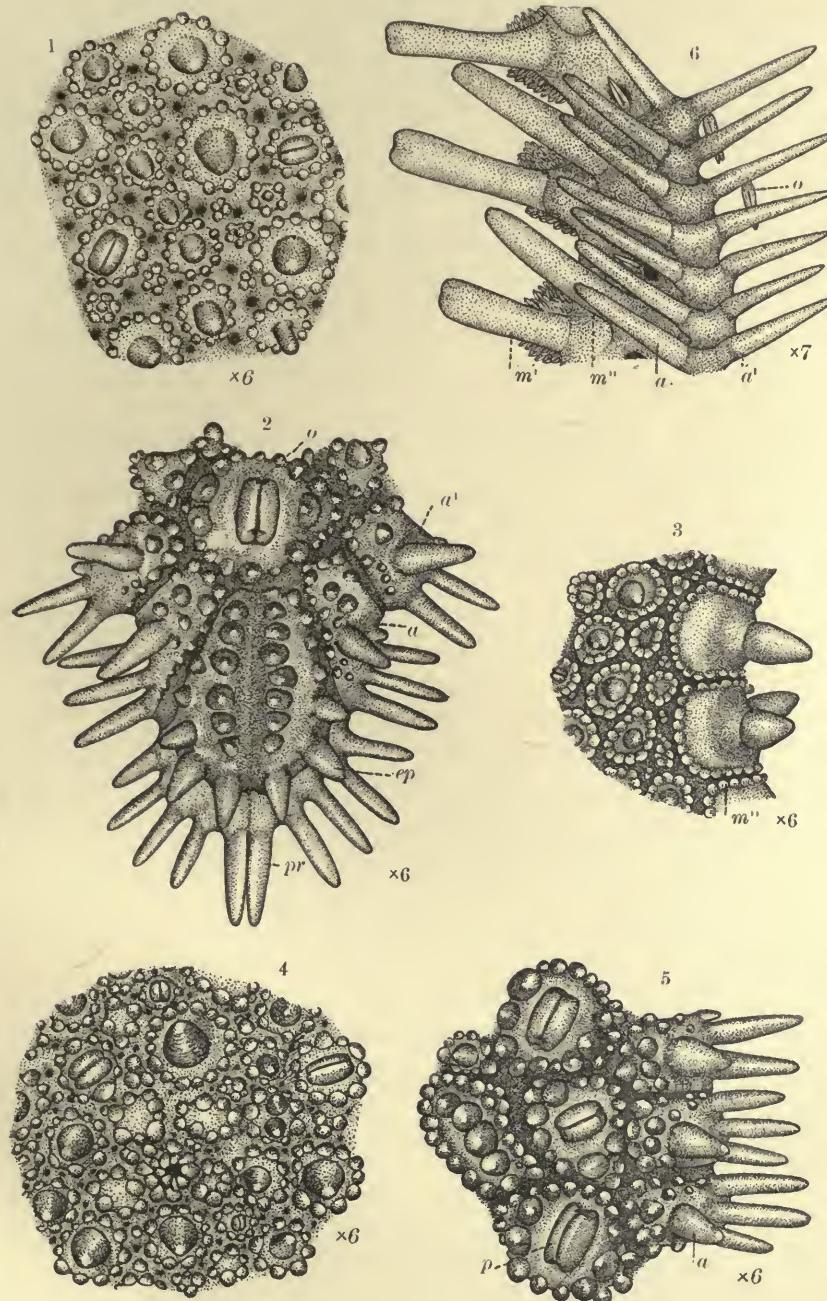
FIG. I. *Hippasteria phrygiana* (Pareb.) Agassiz. Photograph of under side
of an Atlantic specimen; enlarged.



HIPPASTERIA PHRYGIANA (Parel.) Agassiz photograph of under side of an
Atlantic specimen enlarged

PLATE XLVIII.

- FIG. 1. *Hippasteria phrygiana* (Parel.) Agassiz. Part of the dorsal surface of a New England specimen (314); $\times 6$.
- FIG. 2. The same. One of the jaws and adoral plates; a , a' , first and second adambulacral plates; ep , epioral spines; pr , apical peroral spines; o , large valvular pedicellaria on first actinal interradial plate; $\times 6$.
- FIG. 3. The same. Two inferomarginal plates (m'') and adjacent interactinals; $\times 6$.
- FIG. 4. The same. Central part of disk, showing dorsal "anal" or nephridial pore; $\times 6$.
- FIG. 5. The same. Three adambulacral plates and spines (a) and adjacent interactinal plates, each bearing a large valvular pedicellaria; $\times 6$.
- FIG. 6. *Orthasterias tanneri* Verrill. a , outer, and a' , inner adambulacral spines; m' , supramarginals, and m'' , inferomarginals; o , one of the large, acute major pedicellariæ; $\times 7$. From off the Atlantic coast. No. 5524. Yale Mus.



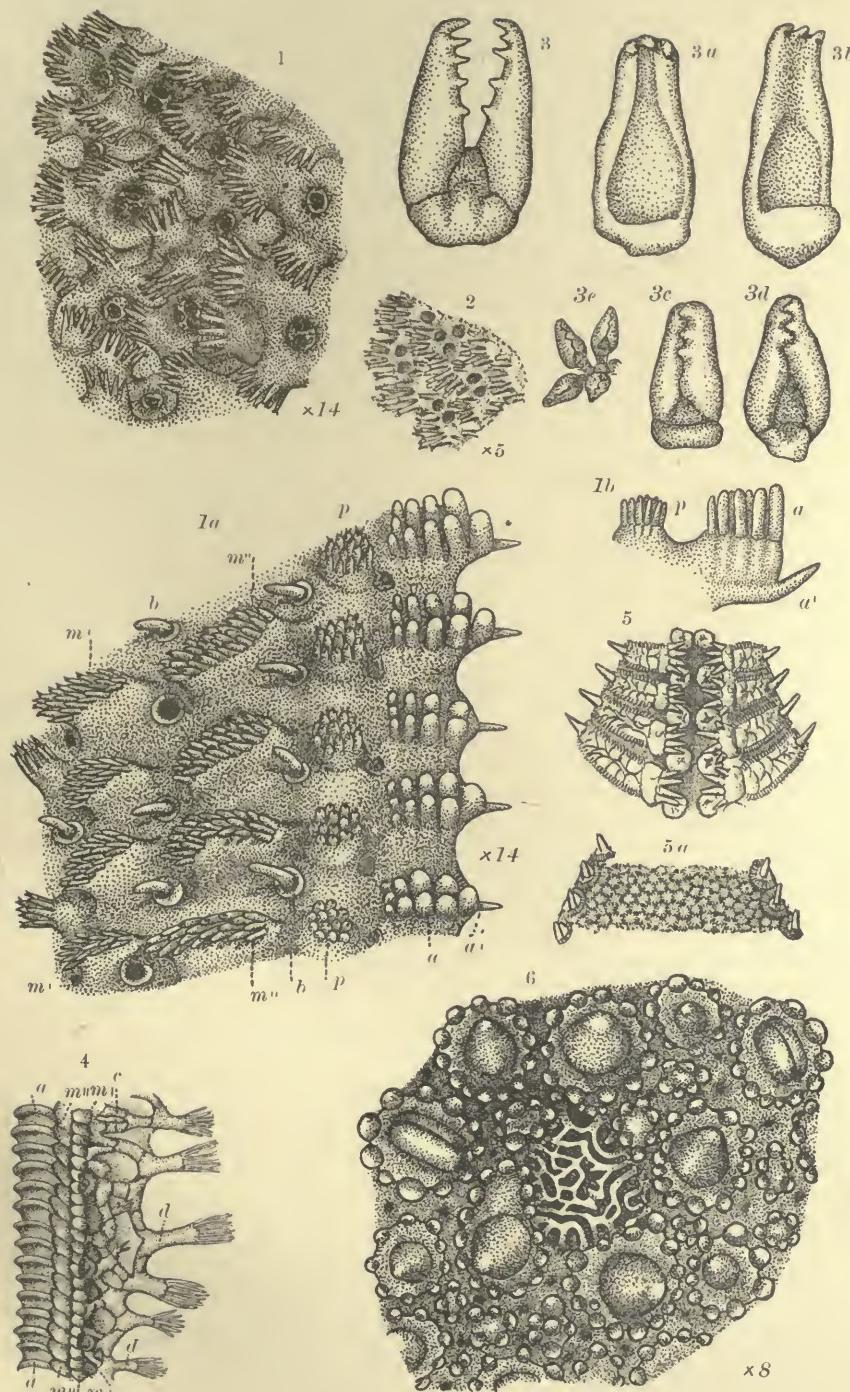
A. H. VERRILL, FROM NATURE.

HELIOTYPE CO.

I-5. *HIPPASTERIA PHRYGINA* (Parel.) Agassiz
 6. *ORTHASTERIAS TANNERI* Verrill

PLATE XLIX.

- FIG. 1. *Henricia sanguinolenta*, var. *pectinata* Verrill. Type. From an Atlantic specimen. Part of the dorsal surface; $\times 14$.
- FIG. 1a. The same specimen. Part of under surface and side of a ray; a , adambulacral spines; a' , inner or groove-spine; p , p , peractinal row of pseudopaxillæ; m' , m' , supramarginals; m'' , m'' , inferomarginals; b , b , papulae; $\times 14$.
- FIG. 1b. The same. Profile view of one interambulacral and one peractinal group of spines; $\times 14$.
- FIG. 2. *Henricia sanguinolenta* (Müll.) Bell. Young. Atlantic specimen. Altered from Duncan and Sladen, $\times 5$.
- Figs. 3-3e. Major or forficulate pedicellariæ of *Pisaster ochraceus*, much enlarged; 3, profile view of one of the larger erect, unguiculate, lateral kind; 3a, 3b, interior surface of valves; 3c, 3d, two of the smaller forms; 3e, a small group of the small pedicellate forms found on the margin of the adambulacral plates.
- FIG. 4. *Crossaster papposus* (Linn.) M. & Tr. Part of the skeleton of a ray, of an Arctic specimen, after Danielssen and Koren; a , a , adambulacral plates; m' , m' , superomarginals; m'' , m'' , inferomarginals; c , connective ossicle; d , dorsal plates and pseudopaxillæ; enlarged.
- FIG. 5. *Ctenodiscus crispatus* (Retz.) D. & Kor. From an Atlantic specimen, after Müller and Troschel. Under side of base of a ray.
- FIG. 5a. The same. Part of the dorsal surface. \times about 2.
- FIG. 6. *Hippasteria phrygiana*. Part of disk, showing madreporic plate; $\times 8$.



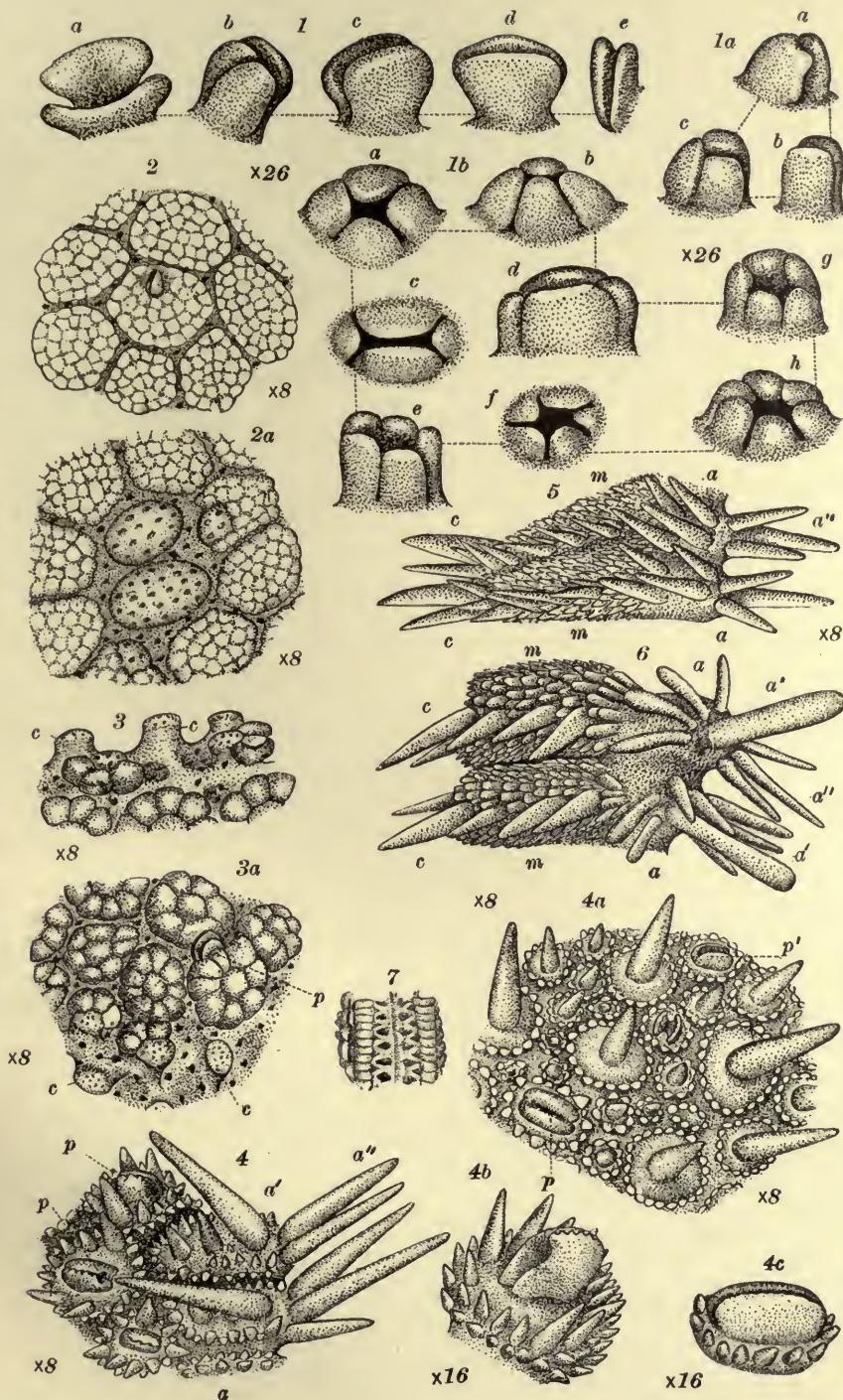
A. H. VERRILL, FROM NATURE.

HELIOTYPE CO.

- 1-1a. *HENRICIA SANGUINOLENTA*, var. *PECTINATA* Verrill
2. *HENRICIA SANGUINOLENTA* (Müll.) Bell
- 3-3e. *PISASTER OCHRAEUS* (Brandt)
4. *CROSSASTER PAPPOSUS* (Linn.) M. & Tr.
- 5-5a. *CTENODISCUS CRISPATUS* (Retz.) D. & Kor.
6. *HIPPASTERIA PHRYGINA* (Parel.) Agassiz

PLATE L.

- FIG. 1. *Dermasterias imbricata* (Grube) Perrier. *a*, *c*, pedicellariæ, mostly bivalved, from actinal side; $\times 26$.
- FIG. 1a. The same specimen. *a-c*, bivalved and trivalved pedicellariæ from the actinal side; $\times 26$.
- FIG. 1b. The same specimen. *a-f*, four-valved and five-valved pedicellariæ from the dorsal side; $\times 26$.
- FIG. 2. *Ceramaster granularis* (Retz.) Verrill. Plates of the dorsal side covered with granules; the central one bears a bivalved pedicellaria; $\times 8$.
- FIG. 2a. The same specimen, with the granules removed from two of the plates; $\times 8$.
- FIG. 3. *Tosiaster arcticus* Verrill. Type. A group of dorsal plates, partially in profile; some of them (*c*, *c*) with the large granules removed; also showing papular pores; $\times 8$.
- FIG. 3a. The same specimen. A group of dorsal plates, some of them (*c*, *c*) with the granules removed; *p*, bivalved pedicellariæ; $\times 8$.
- FIG. 4. *Hippasteria spinosa* Verrill. Type. *a'*, *a'* inner, and *a*, outer adambulacral spines; *p*, *p'*, pedicellariæ of actinal plates; $\times 8$.
- FIG. 4a. The same specimen. A group of dorsal plates and spines; *p*, *p*, pedicellariæ; $\times 8$.
- FIG. 4b. The same specimen. One of the dorsal plates with a pedicellaria; \times about 16.
- FIG. 4c. The same. A dorsal pedicellaria of the broad form; \times about 16.
- FIG. 5. *Astropecten californicus* Fisher. Actinal side; *a'*, *a'*, inner, and *a*, *a*, outer adambulacral spines; *m*, *m*, inferom marginal plates; *c*, *c*, inferom marginal spines; $\times 8$.
- FIG. 6. *Astropecten siderealis* Verrill. Actinal side; *a*, *a*, outer adambulacral spines; *a'*, central spine of the adambulacral plate; *a''*, furrow spines; *c*, *c*, inferom marginal spines; *m*, *m*, inferom marginal plates; $\times 8$.
- FIG. 7. *Stenasterias macropora* Verrill. Type. Portion of the actinal side of a ray, with the spines removed; $\times 5$.



A. HYATT VERRILL DEL.

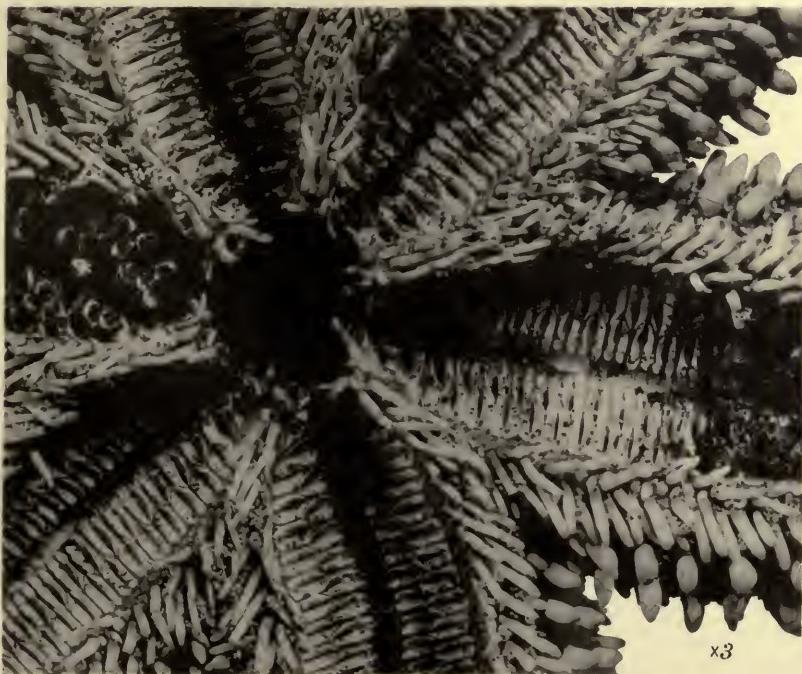
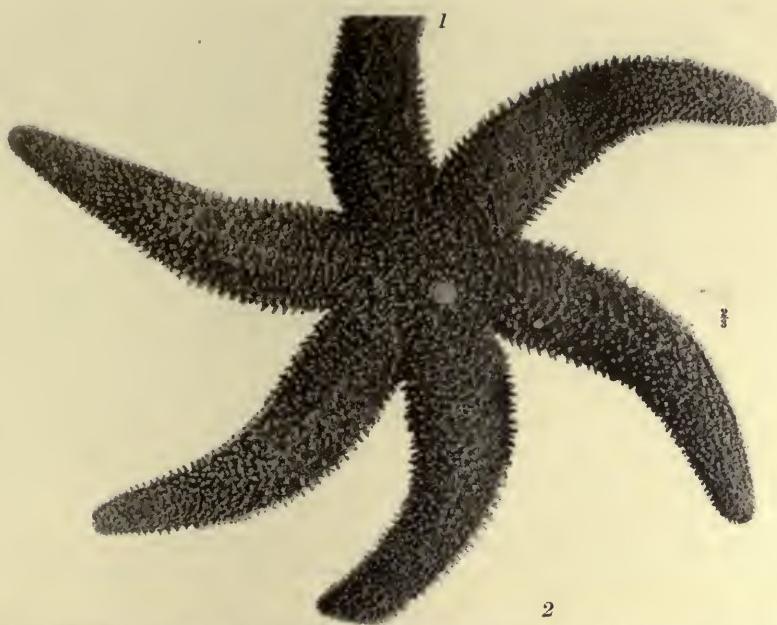
1-1b. *DERMASTERIAS IMBRICATA* (GRUBE)2.2a. *CERMASTER GRANULARIS* (M.)3.3a. *TOSIASTER ARCTICUS* VER.4-4c. *HIPPASTERIA SPINOSA* VER.5. *ASTROPECTEN CALIFORNICUS* F. 6. *A. SIDEREALIS* VER.7. *STENASTERIAS MACROPORA* VER.

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PLATE LI.

FIG. 1. *Asterias katherinæ* Gray. Dorsal view of No. 1181, Mus. Comp. Zoöl.;
 $\frac{2}{3}$ natural size. Gulf of Georgia.

FIG. 2. The same specimen. Actinal side; $\times 3$.



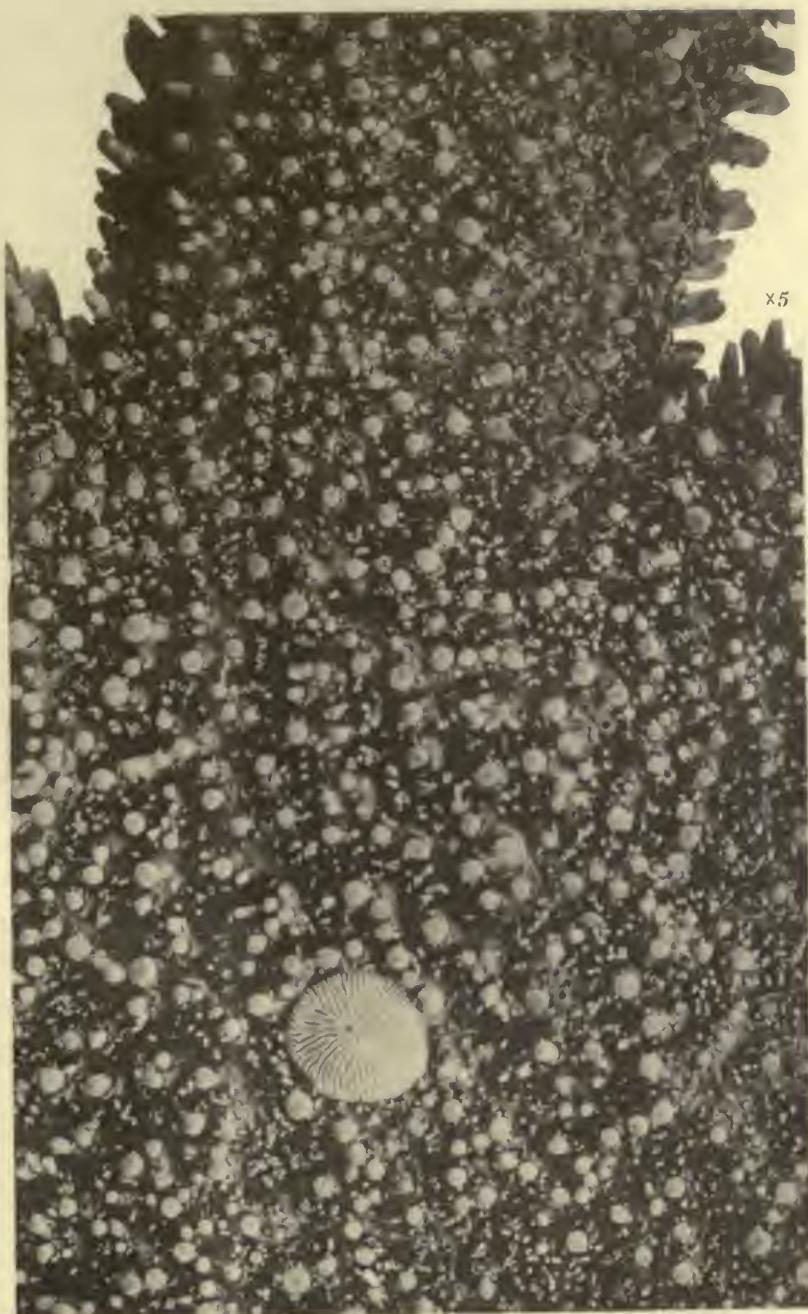
HELIOTYPE CO., BOSTON

1.2. ASTERIAS KATHERINAE GRAY

PLATE LII.

Asterias katherinae Gray. Dorsal side of the same specimen shown on pl. LI;
X 4 $\frac{1}{2}$. Gulf of Georgia. No. 1181, Mus. Comp. Zoöl.

(106)



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ASTERIAS KATHERINAE GRAY

PLATE LIII.

FIG. 1. *Asterias victoriana* Verrill. Type. Dorsal view; $\frac{3}{4}$ natural size.
FIG. 2. *Pisaster confertus* (Stimpson) Verrill. \times about $1\frac{1}{8}$.



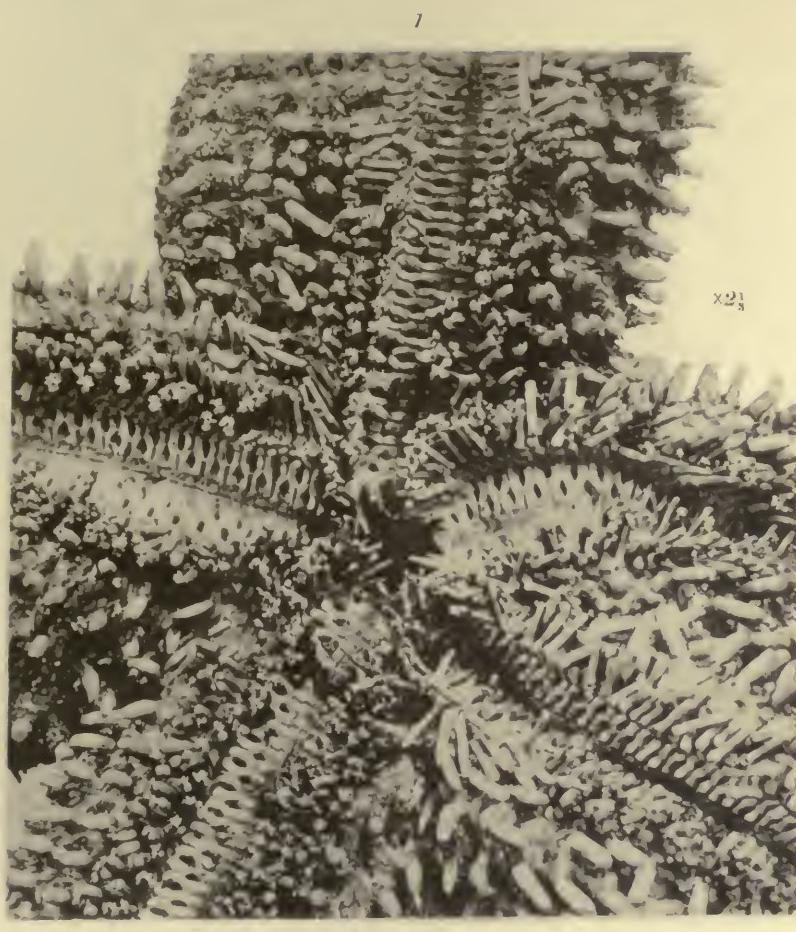
HELIOTYPE CO., BOSTON

1. *ASTERIAS VICTORIANA* VER. Type
2. *PISASTER CONFERTUS* (St.)

PLATE LIV.

FIG. 1. *Asterias victoriana* Verrill. Type. Actinal side; $\times 2\frac{1}{3}$.

FIG. 2. The same specimen. Side view of a ray; $\times 2\frac{2}{3}$. Vancouver I.



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1.2. ASTERIAS VICTORIANA VER. Type

PLATE LV.

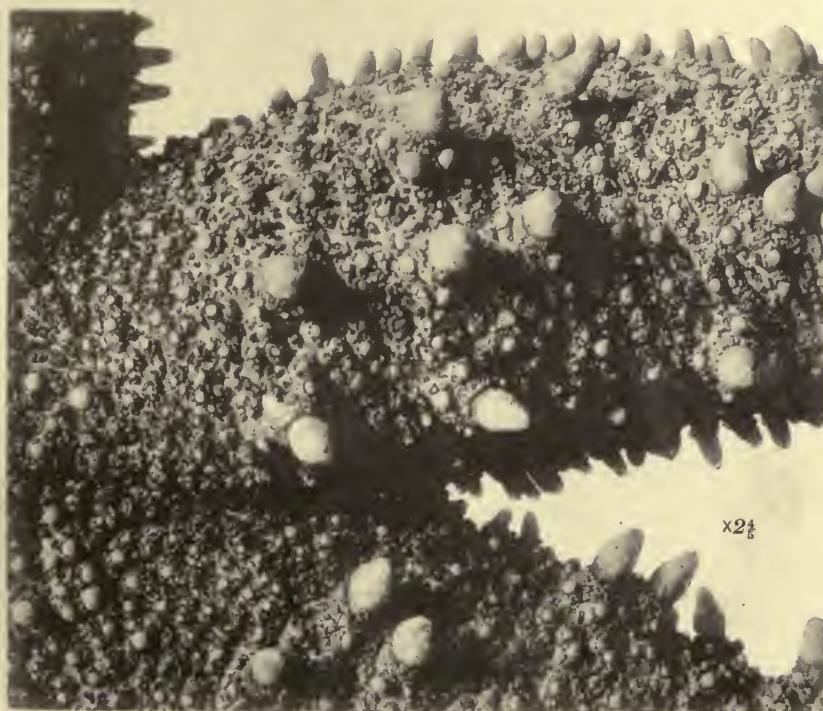
FIG. 1. *Asterias polythela* Verrill. Type. Dorsal side; about $\frac{2}{3}$ natural size.
FIG. 2. The same specimen. Part of dorsal side; $\times 2\frac{1}{2}$. No. 5820.

1



CANIS

2



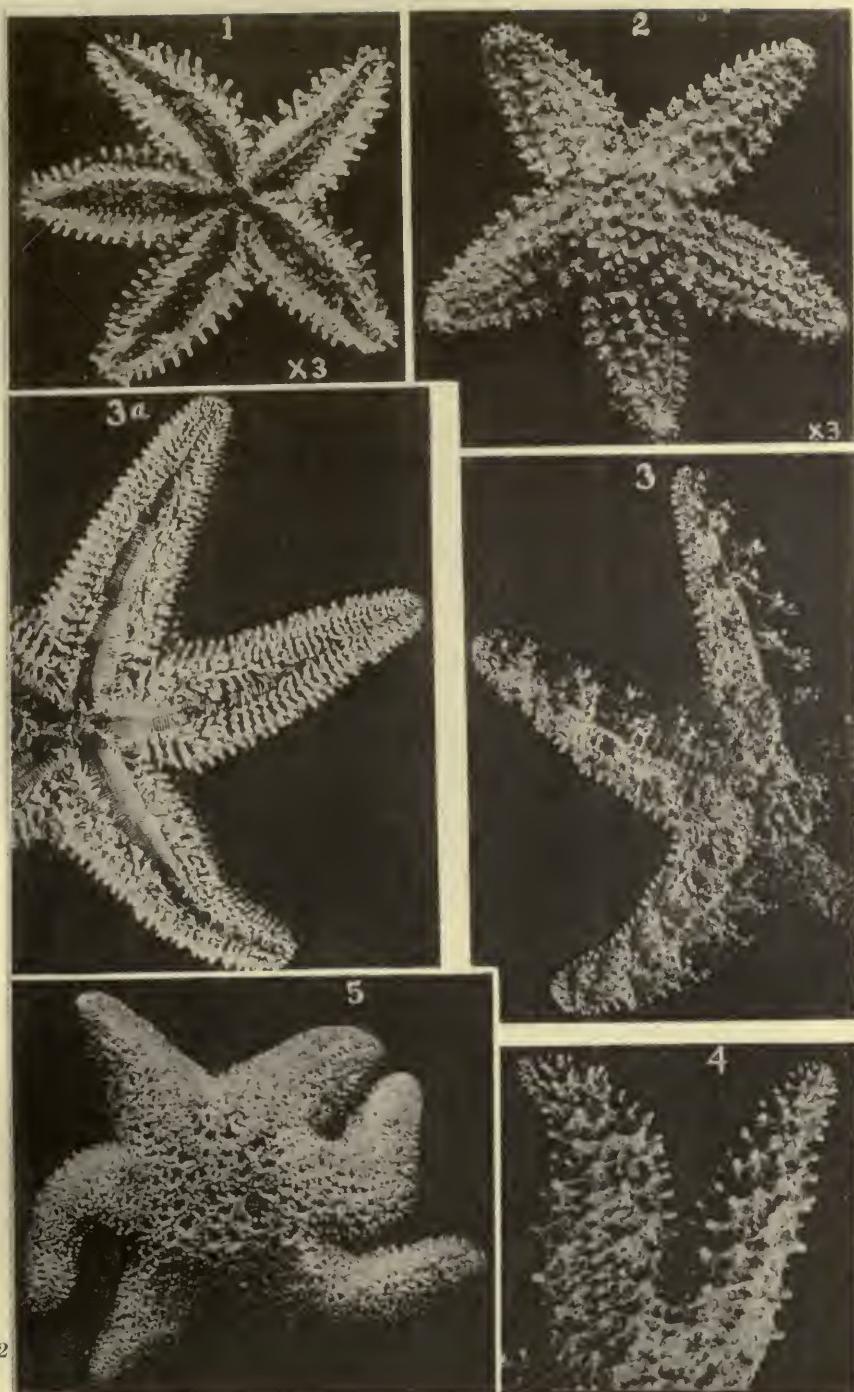
$\times 2\frac{1}{5}$

HELIOTYPE CO., BOSTON

1.2. ARTERIAS POLYTHELA VER. Type

PLATE LVI.

- FIGS. 1, 2. *Leptasterias arctica* (Murdoch) (?). Young. Actinal and dorsal views of specimens from Bering Sea; $\times 3$. No. 16591, U. S. Nat. Mus.
- FIGS. 3, 3a. *Pisaster ochraceus*, var. *nodiferus* Verrill. Dorsal and actinal views; about $\frac{2}{3}$ natural size (*nodosus* on plate incorrect).
- FIG. 4. *P. capitatus* (Stimpson) Verrill. Dorsal side of two rays; about $\frac{2}{3}$ natural size.
- FIG. 5. *Leptasterias æqualis* (Stimpson), var. *compacta* Verrill. Type. Dorsal side; $\times 2$. Yale Mus.



HELIOTYPE CO., BOSTON

1, 2. *LEPTASTERIAS ARCTICA* (MUR.) YOUNG3-3a. *PISASTER OCHRACEUS NODOSUS* VER.4. *PISASTER CAPITATUS* (St.)5. *LEPTASTERIAS AEQUALIS COMPACTA* VER.

PLATE LVII.

FIG. 1. *Parasterias albertainis* Verrill. Type. Dorsal side; $\times 1\frac{1}{2}$.
FIG. 2. The same specimen. Actinal side; $\times 3\frac{3}{4}$.

1



$\times 7\frac{1}{2}$

2



$\times 3\frac{3}{4}$

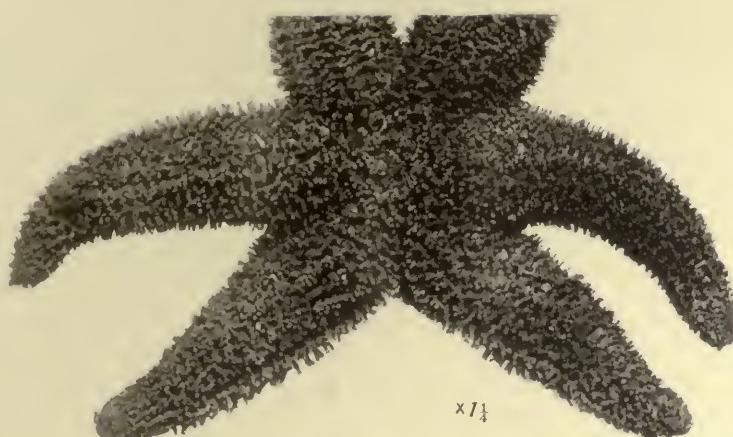
HELIOTYPE CO., BOSTON

1.2. PARASTERIAS ALBERTENSIS VER. Type

PLATE LVIII.

FIG. 1. *Leptasterias epichlora*, var. *plena* Verrill. Type. Dorsal view;
 $\times \frac{1}{4}$. Vancouver I.
FIG. 2. *Asterias multiclava* Verrill. Type. About $\frac{2}{3}$ natural size.

1



2



HELIOTYPE CO., BOSTON

1. *LEPTASTERIAS EPICHLORA PLENA* VER. Type
2. *ASTERIAS MULTICLAVA* VER. Type

PLATE LIX.

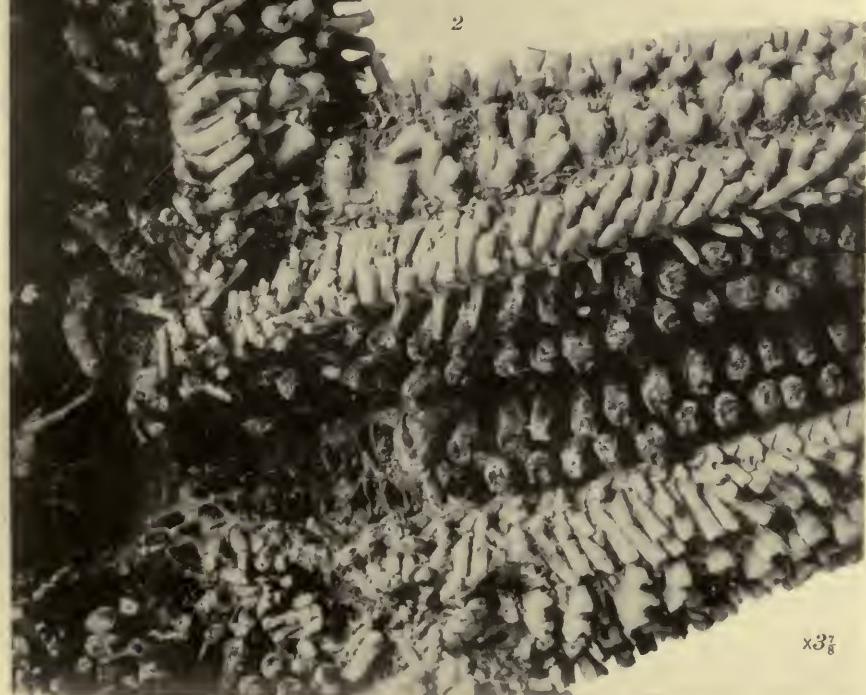
- FIG. 1. *Asterias multiclava* Verrill. Type. Actinal side; $\times 2\frac{2}{3}$. Bering I.
No. 15841, U. S. Nat. Mus.
- FIG. 2. *Allasterias anomala* Verrill. Type. Actinal side; $\times 3\frac{1}{8}$. Arctic
Alaska (L. M. Turner, 1874). No. 3821, U. S. Nat. Mus.

(120)

1



2



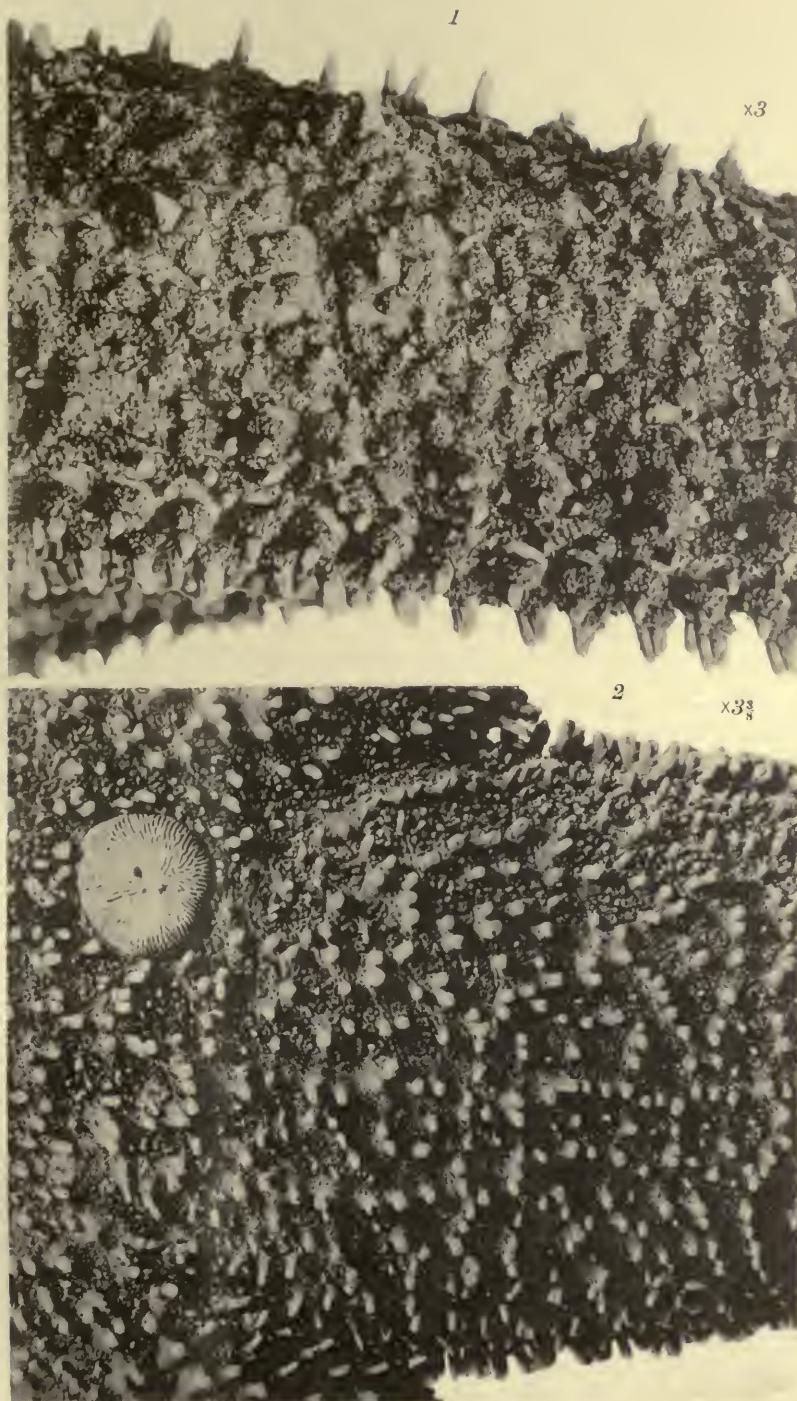
HELIOTYPE CO., BOSTON

1. *ASTERIAS MULTICLAVA* Ver. Type

2. *ALLASTERIAS ANOMALA* Ver. Type

PLATE LX.

- FIG. 1. *Pisaster papulosus* Verrill. Cotype. Side view of a ray, near base; \times about 3. Vancouver I.
- FIG. 2. *Allasterias anomala* Verrill. Type. Dorsal view; $\times 3\frac{1}{2}$. St. Michael's I., Arctic Alaska (L. M. Turner). No. 3821, U. S. Nat. Mus.

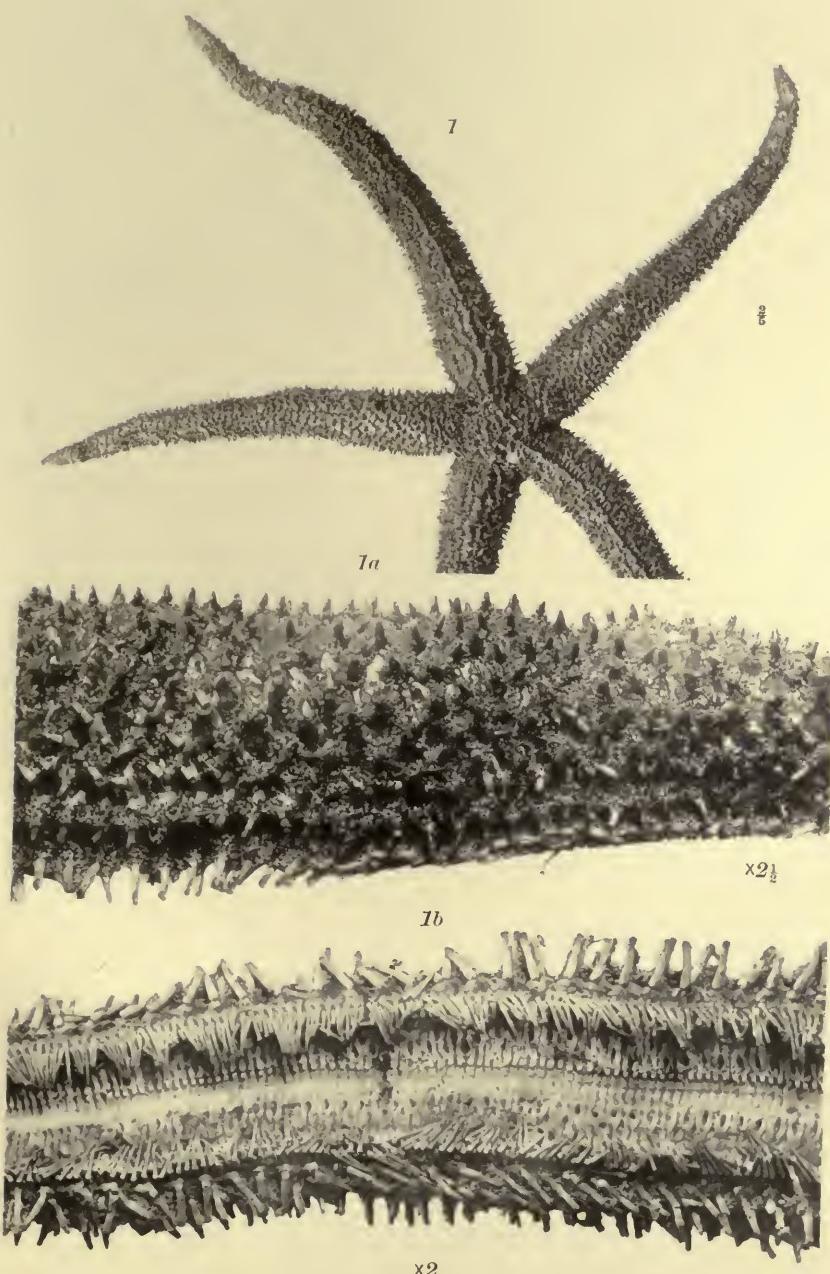


HELIOTYPE CO., BOSTON

1. *PISASTER PAPULOSUS* Ver.
2. *ALLASTERIAS ANOMALA* Ver. Type

PLATE LXI.

- FIG. I. *Asterias nanimensis* Verrill. Type. Dorsal side; about $\frac{2}{3}$ natural size. Vancouver I. Canadian Geol. Survey.
FIG. Ia. The same specimen. Side view of a ray; $\times 2\frac{1}{2}$.
FIG. Ib. The same specimen. Actinal side of a ray; $\times 2$.



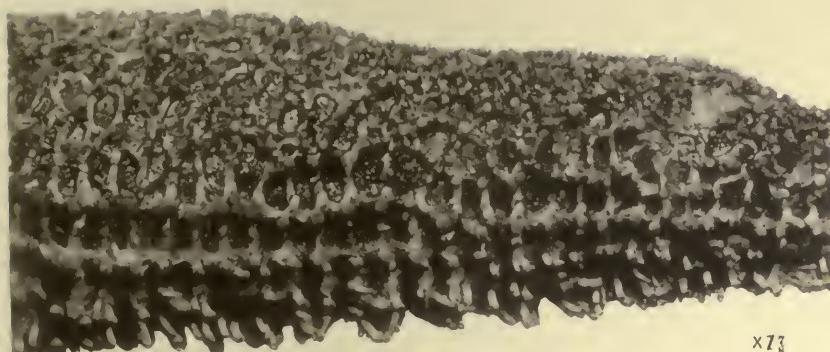
HELIOTYPE CO., BOSTON

I, 1b. *ASTERIAS MANIMENSIS* VER. Type

PLATE LXII.

- FIG. 1. *Evasterias troschelii*, var. *alveolata* Verrill. Type. Side view of a ray; $\times 1\frac{1}{2}$.
- FIG. 2. *Orthasterias forreri forcipulata* Verrill. Type. Dorsal view of a ray; $\times 1\frac{1}{2}$. Vancouver I.
- FIG. 3. The same specimen. Actinal side of a ray; $\times 1\frac{1}{2}$.

7



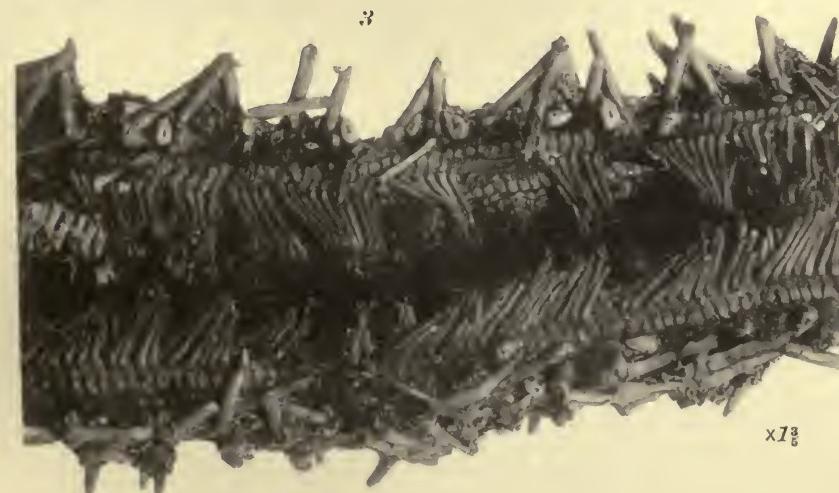
$\times 77$

2



$\times 73$

3



$\times 75$

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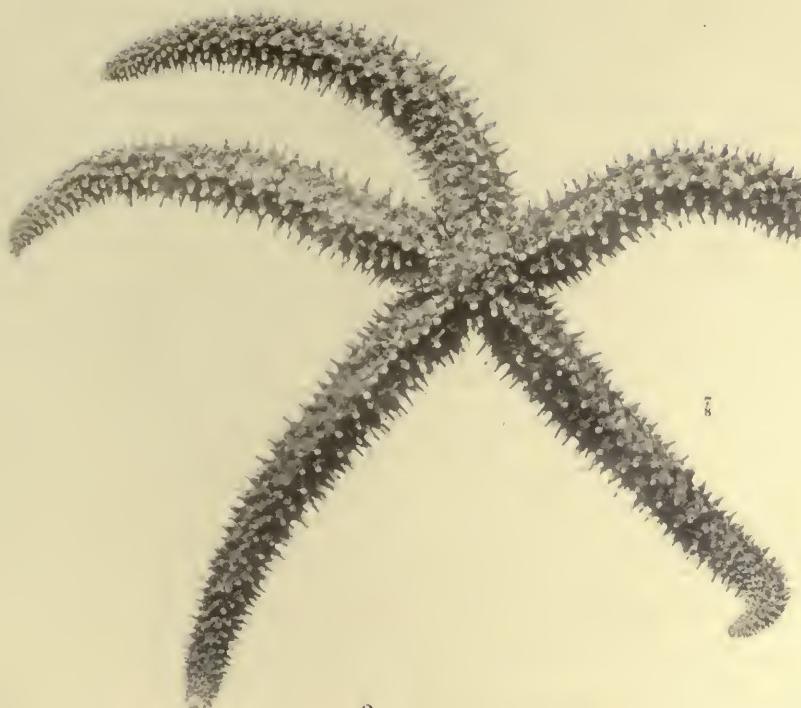
1. *EVASTERIAS TROSCHELII ALVEOLATA* VER. Type
- 2.3. *ORTIASTERIAS FORRERI FORCIPULATA* VER. Type

PLATE LXIII.

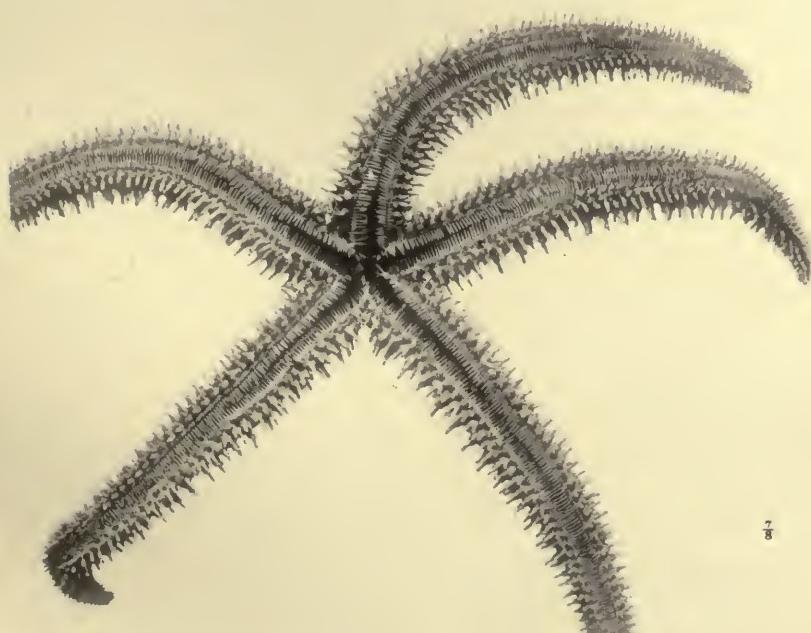
- FIG. 1. *Orthasterias biordinata* Verrill. Type. About $\frac{7}{8}$ natural size.
FIG. 2. The same specimen. Actinal side; $\frac{7}{8}$ natural size.

(128)

1



2



HELIOTYPE CO., BOSTON

1.2. *ORTHASTERIAS BIORDINATA* VER. Type

PLATE LXIV.

- FIG. 1. *Orthasterias leptolena* Verrill. Type. Actinal side; about $\frac{7}{8}$ natural size. Canadian Geol. Survey.
FIG. 1a. The same specimen. Dorsal side; $\frac{7}{8}$ natural size.
FIG. 2. The same. A young specimen. Actinal side; $\frac{9}{10}$ natural size.
FIG. 2a. The same specimen. Dorsal side; $\frac{9}{10}$ natural size. One ray is lost.

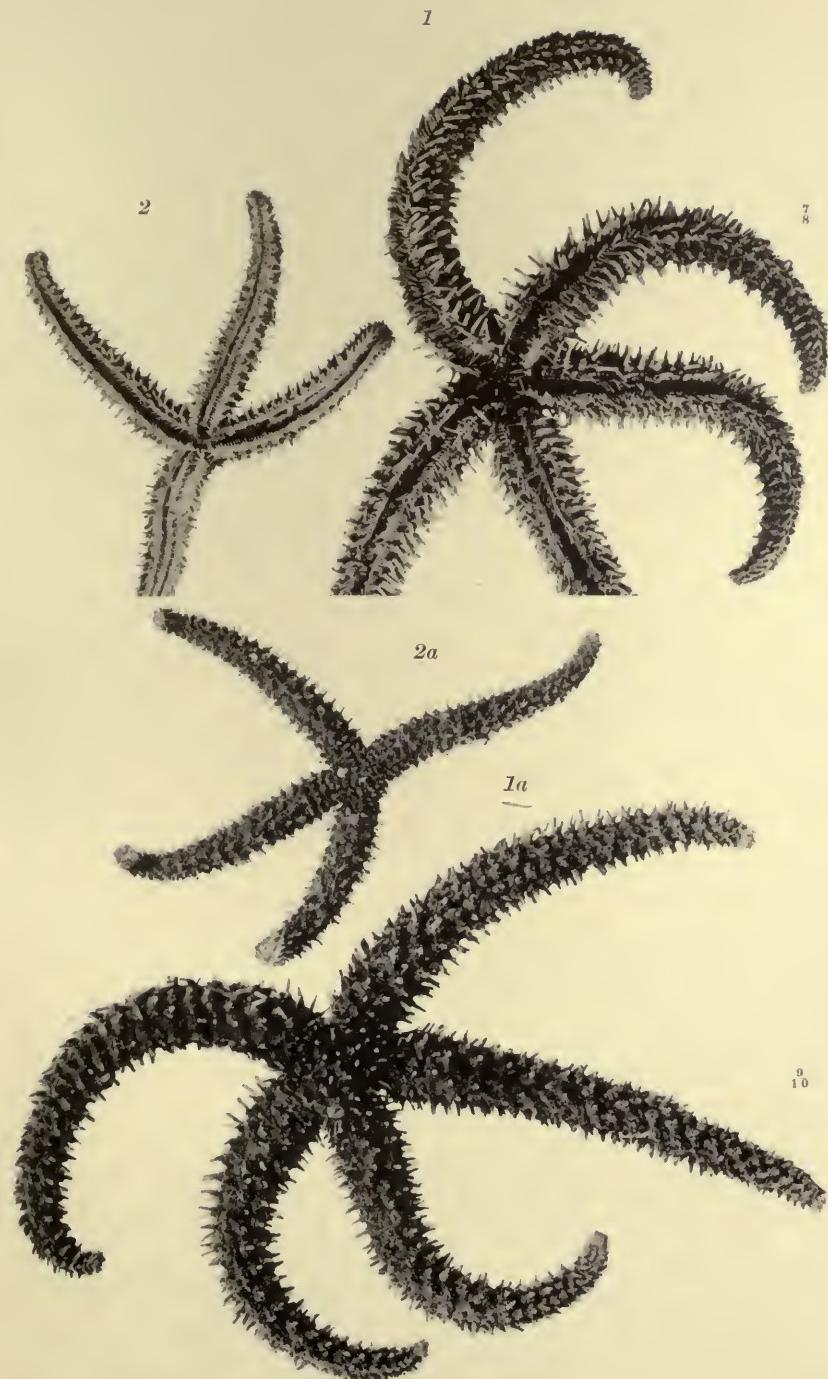


PLATE LXV.

- FIG. 1. *Orthasterias forreri* (de Loriol) Verrill. Dorsal side; about $\frac{4}{5}$ natural size. No. 1823, Mus. Comp. Zoölogy.
FIG. 2. *Orthasterias columbiana* Verrill. Young. Dorsal side; about natural size.



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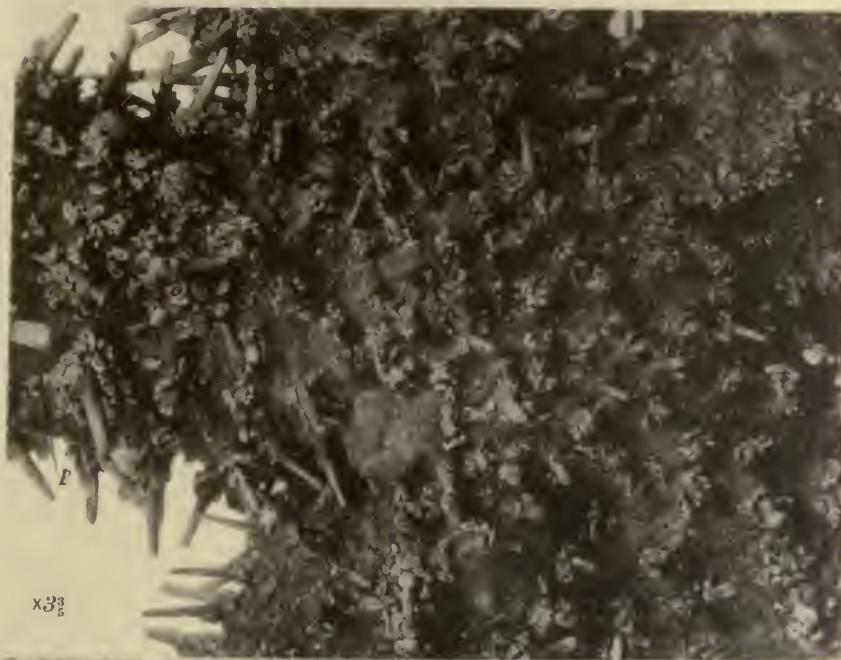
1. *ORTHASTERIAS FORSTERI* (LOR.)
2. *O. COLUMBIANA* VER. YOUNG

PLATE LXVI.

FIG. 1. *Orthasterias forreri* (Loriol) Verrill. Dorsal view of disk and base
of ray; *P*, major pedicellaria; $\times 3\frac{1}{3}$. No. 1823.

FIG. 2. The same specimen. Actinal side; $\times 3\frac{1}{3}$. No. 1823, Mus. Comp. Zoöl.

1



$\times 3\frac{3}{5}$

2



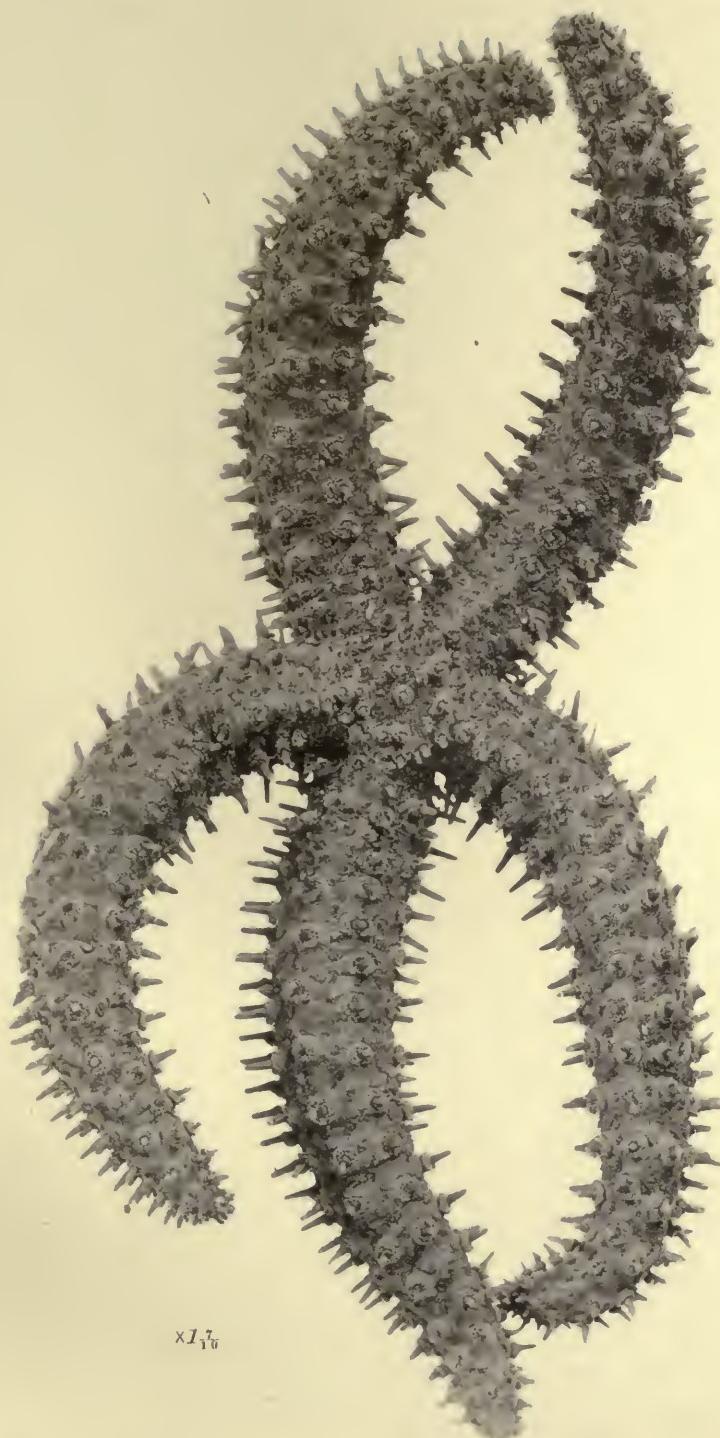
$\times 3\frac{3}{5}$

HELIOTYPE CO., BOSTON

1.2. *ORTHASTERIAS FORRERI* (LOR.)

PLATE LXVII.

Orthasterias gonolena Verrill. Dorsal view; $\times 1\frac{3}{4}$. Off San Francisco. Yale Mus.



HELIOTYPE CO., BOSTON

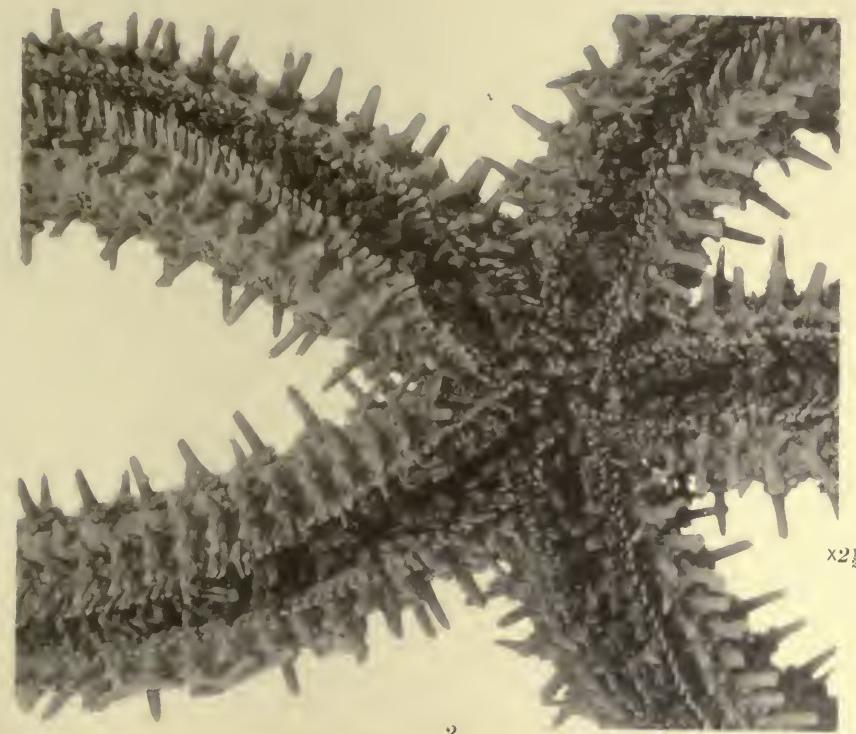
ORTHASTERIAS GONOLENA VER.

PLATE LXVIII.

FIG. 1. *Orthasterias gonolena* Verrill. Ventral view of the same specimen as
in pl. LXVII; $\times 2\frac{1}{2}$.

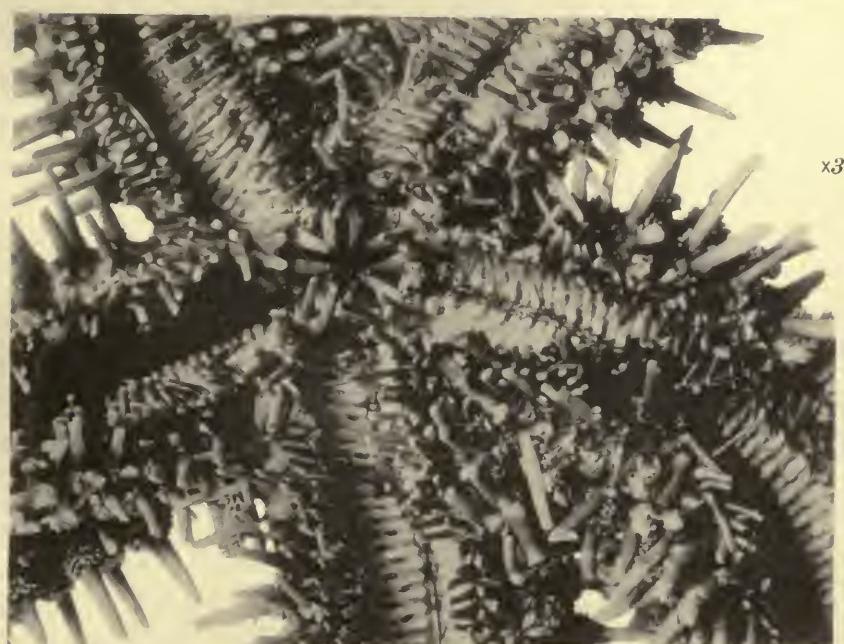
FIG. 2. *Orthasterias californica* Verrill. Type. Actinal side; $\times 3\frac{1}{8}$.

1



$\times 2\frac{1}{2}$

2



$\times 3\frac{1}{8}$

HELIOTYPE CO., BOSTON

1. *ORTIASTERIAS GONOLEMA* VER.
2. *O. CALIFORNICA* VER. Type

PLATE LXIX.

- FIG. 1. *Asterias multiclava* Verrill. Type. Portion of the actinal side of a ray; \times about $4\frac{1}{2}$.
- FIG. 2. *Orthasterias gonolena* Verrill. Portion of the actinal side of a ray; $\times 4$.
- FIG. 3. *Pisaster brevispinus* (Stimpson) Verrill. Portion of actinal side of a ray; $\times 3$.
- FIG. 4. *Asterias victoriana* Verrill. Type. Portion of the actinal side of a ray; $\times 2\frac{1}{2}$.
- FIG. 5. *Allasterias anomala* Verrill. Type. Portion of the actinal side of a ray; $\times 5\frac{1}{2}$. St. Michael, Alaska (L. M. Turner, 1874).

1



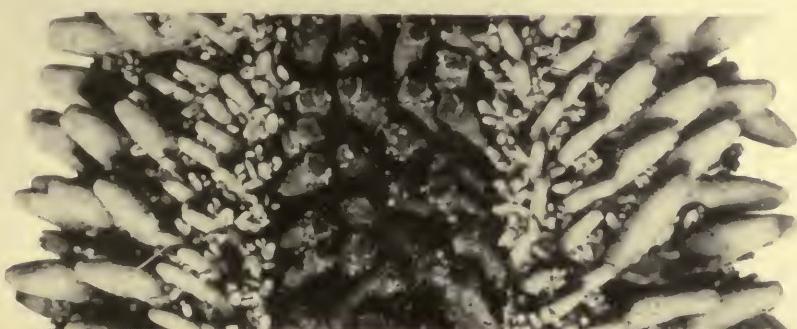
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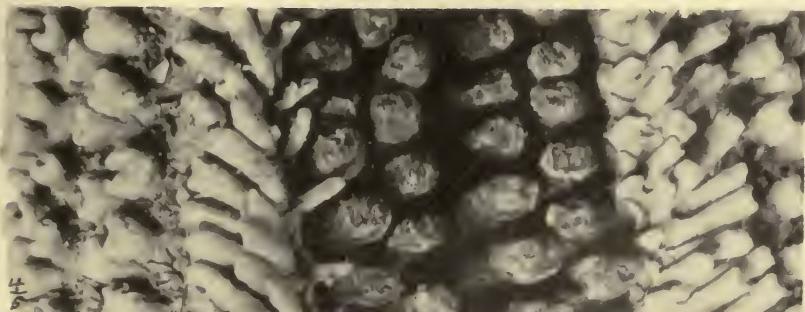
3



4



5



HELIOTYPE CO., BOSTON

1. ASTERIAS MULTICLAVA VER. Type

2. ORTHIASTERIAS GONOLENA VER.

3. PISASTER BREVISPINUS (St.)

4. ASTERIAS VICTORIANA VER.

5. ALLASTERIAS ANOMALA VER. Type

PLATE LXX.

- FIG. 1. *Urasterias linckii* (Müller and Troschel) Verrill. Portion of the actinal side of a ray of a North Atlantic specimen; $\times 3$.
- FIG. 2. The same specimen. Portion of the dorsal side of a ray; $\times 3$.
- FIG. 3. The same specimen. Madreporite with surrounding pedicellariæ and spines; $\times 3$.
- FIG. 4. The same specimen. Nephridial pore or so-called "anal pore" and surrounding pedicellariæ; $\times 3$.
- FIG. 5. *Orthasterias californica* Verrill. Type. Portion of the actinal side of a ray; $\times 4\frac{1}{4}$.
- FIG. 6. *Parasterias albertainis* Verrill. Type. Portion of the actinal side of a ray; $\times 5$. British Columbia. Yale Mus.
- FIG. 7. *Orthasterias forreri* (Loriol) Verrill. Type. Portion of the dorsal side of a ray, showing the very large minor pedicellariæ; $\times 5\frac{1}{2}$.
- FIG. 8. *Asterias polythela* Verrill. Type. Portion of the dorsal side of a ray; $\times 4$. Arctic America; Steamer Corwin. No. 15820.
- FIG. 9. *Orthasterias forreri forcipulata* Verrill. Type. Portion of the side of a ray; $\times 2$.

1



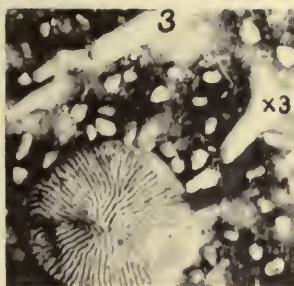
2



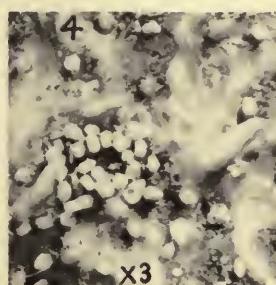
5



3



6



7



9



HELIOTYPE CO., BOSTON

- 1-4. *URASTERIAS LINCKII* (M. & Tr.) ATLANTIC
5. *ORTHASTERIAS CALIFORNICA* Ver. Type
6. *PARASTERIAS ALBERTENSIS* Ver. Type
7. *ORTHASTERIAS FORRERI* (Lor.)
8. *ASTERIAS POLYTHIELA* Ver. Type
9. *ORTHASTERIAS FORRERI FORCIPULATA* Ver. Type

PLATE LXXI.

- FIG. 1. *Leptasterias arctica* (Murdoch) Verrill. Dorsal side; $\times 1\frac{1}{2}$. No. 1428, Mus. Comp. Zoöl.
FIG. 2. *L. arctica* (Murdoch). Dorsal side; $\times 1\frac{1}{2}$. Same number. Both from Alaska.

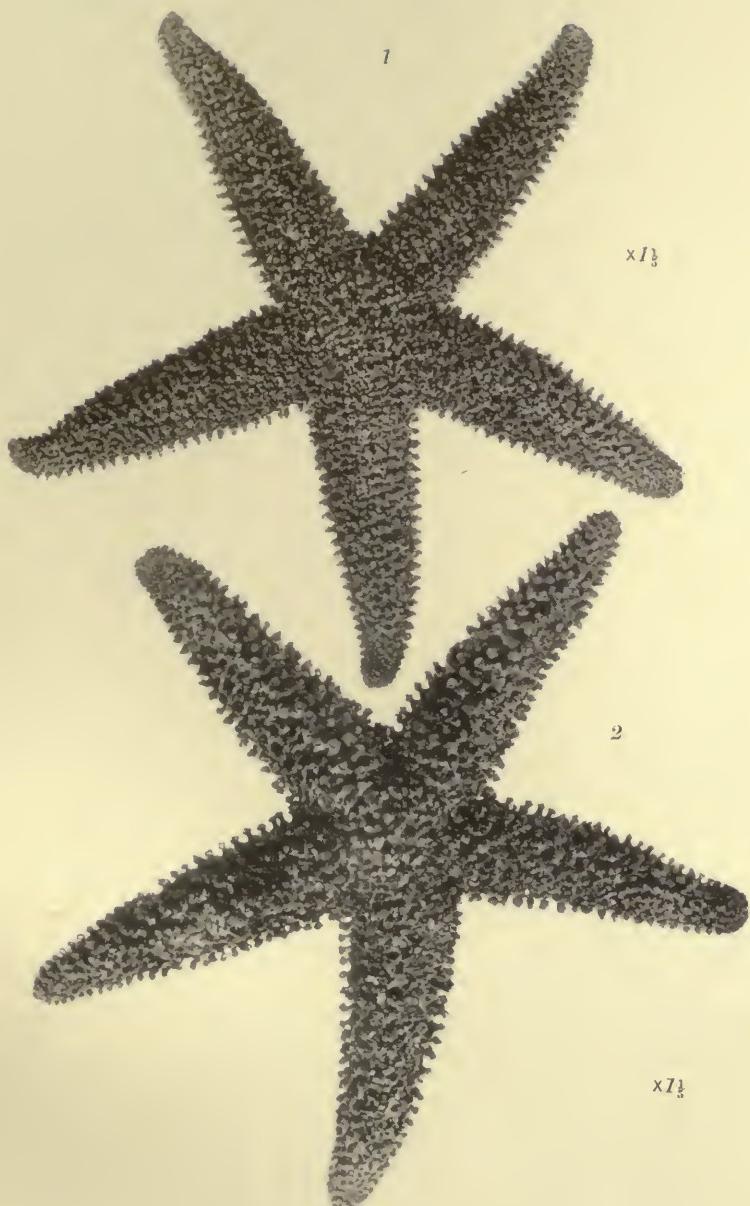
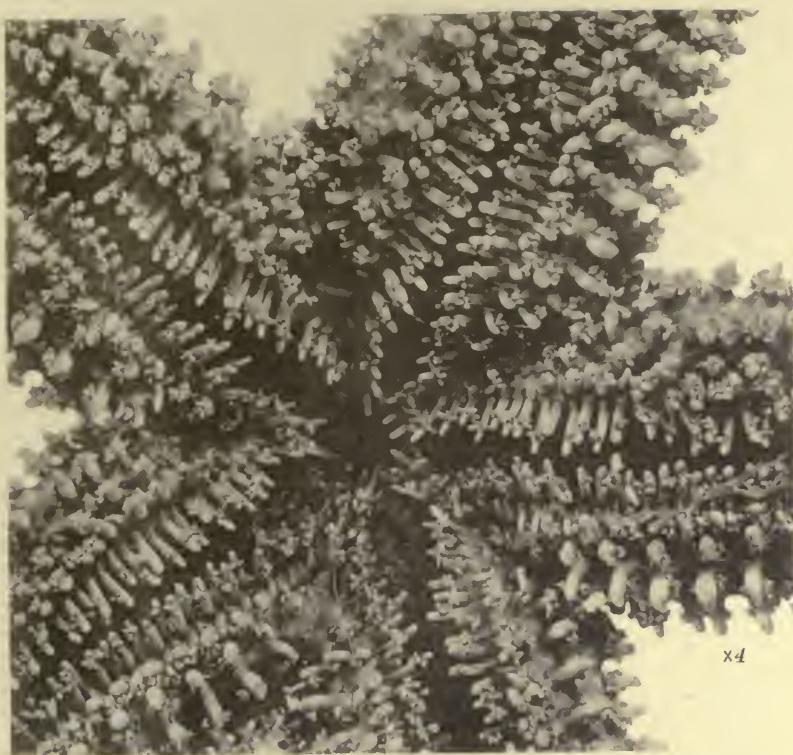


PLATE LXXII.

FIG. 1. *Leptasterias arctica* (Murdoch). Actinal side; $\times 4$. Alaska.
No. 1428. Mus. Comp. Zoöl.

FIG. 2. *Asterias polythela* Verrill. Type. Actinal side; $\times 3\frac{1}{2}$. Arctic Alaska,
Steamer Corwin. No. 15820.

1



2

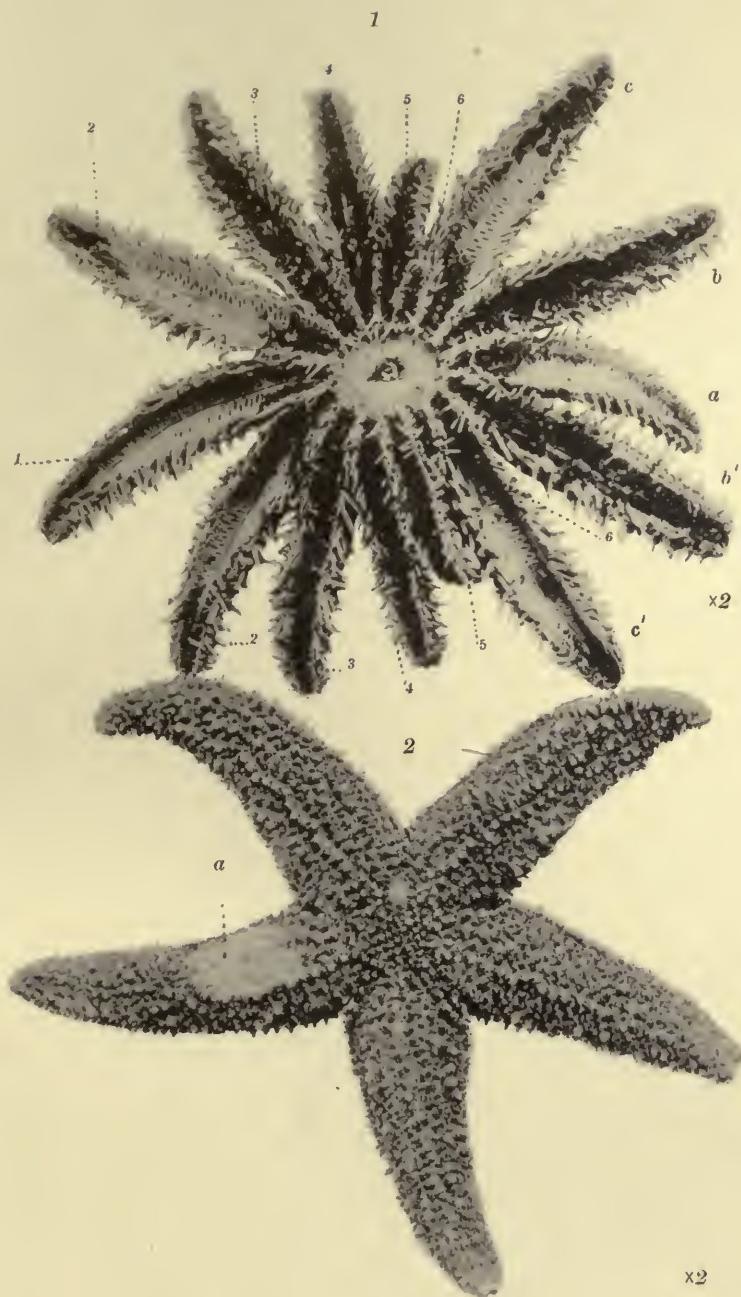


HELIOTYPE CO., BOSTON

1. LEPTASTERIAS ARCTICA (MUR.)
2. ASTERIAS POLYTHELA VER. Type

PLATE LXXIII.

- FIG. 1. *Pycnopodia helianthoides*. Young, with sixteen rays, showing regular normal mode of interpolation of new rays; 1, odd anterior primary ray; 2, 3, 4, 5, 6, successive pairs of interpolated rays; *a*, odd posterior primary ray; *b*, *b'* and *c*, *c'* second and third pairs of primary posterior rays; $\times 2$.
- FIG. 2. *Leptasterias inequalis* Verrill. Type. Dorsal side; *a*, ossicles, with spines removed; $\times 2$.

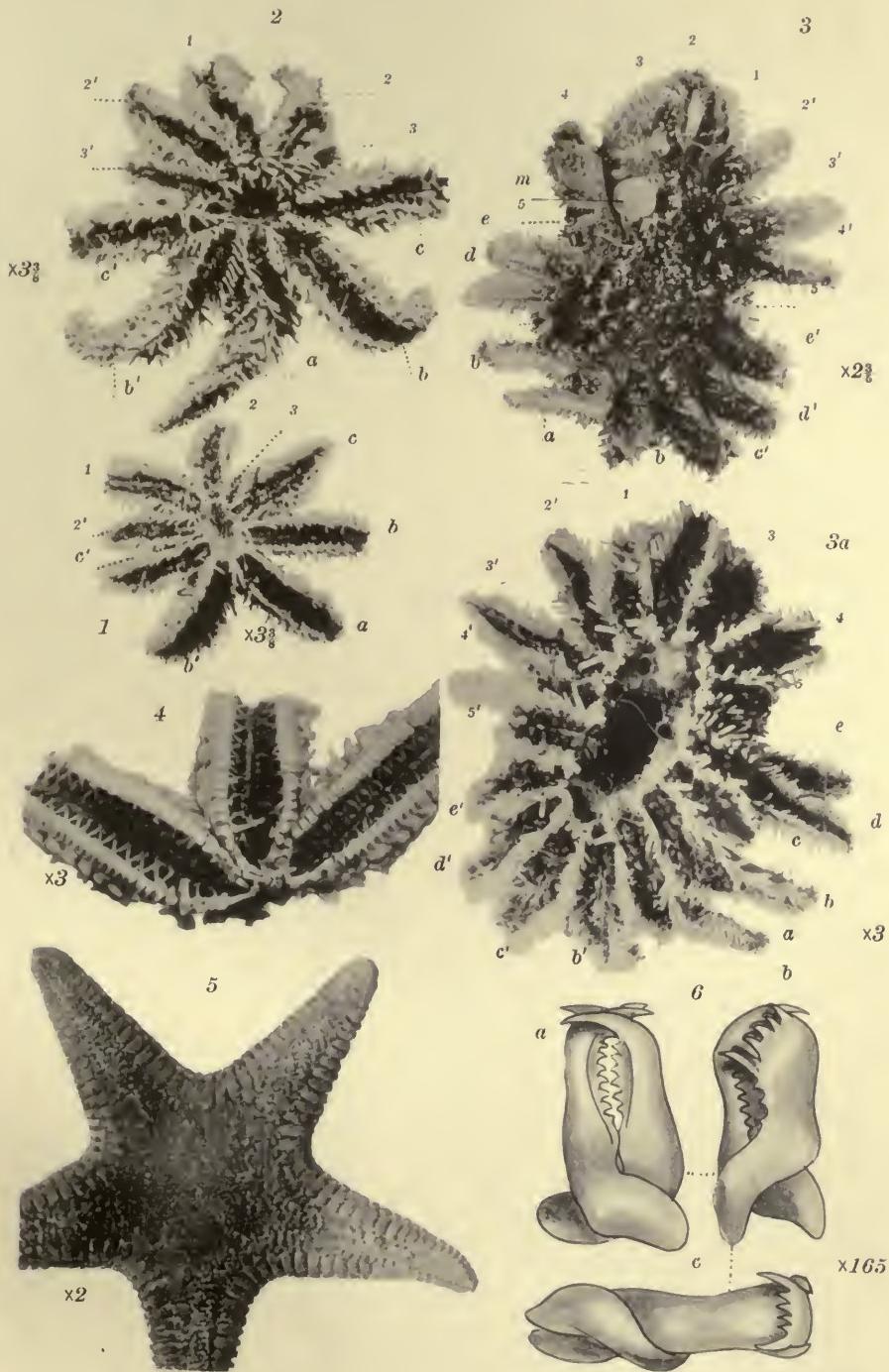


HELIOTYPE CO., BOSTON

1. *Pycnopodia helianthoides* (Br.) YOUNG
2. *Leptasterias inequalis* VER. Type

PLATE LXXIV.

- FIG. 1. *Pycnopodia helianthoides*. Very young, with nine rays; 1, odd anterior primary ray; 2, 2', first pair of interpolated rays; 3, small budding ray of second pair; 3', position in which the mate to No. 3 should appear, but no rudiment of it is visible externally; a, odd posterior primary ray; b, b' and c, c', second and third pairs of posterior primary rays; $\times 3\frac{1}{2}$. From Dutch Harbor, Alaska.
- FIG. 2. The same. A somewhat larger specimen with ten rays, in normal order; $\times 3\frac{1}{2}$. Lettering as in fig. 1. From Kadiak.
- FIG. 3. The same. A somewhat larger, abnormal, oblong young specimen with eighteen rays, not all in regular order (see page 200); m, madreporic plate of abnormal size; $\times 2\frac{1}{2}$. Lettering of rays as in fig. 2, with the addition of pairs 4 and 5 anteriorly, and d, d' and e, e' posteriorly. The last two pairs are abnormal; c is an abnormal budding ray. From Kadiak, Alaska.
- FIG. 3a. The same specimen. Actinal side; $\times 3$. Lettering as in fig. 3.
- FIG. 4. *Stenasterias macropora* Verrill. Type. Portion of the actinal side with the spines removed; $\times 3$.
- FIG. 5. *Leptychaster pacificus* Fisher. Dorsal view; \times about 2.
- FIG. 6. *Pycnopodia helianthoides* (Brandt). Minor pedicellariæ; a, b, c, side and profile views; $\times 165$.

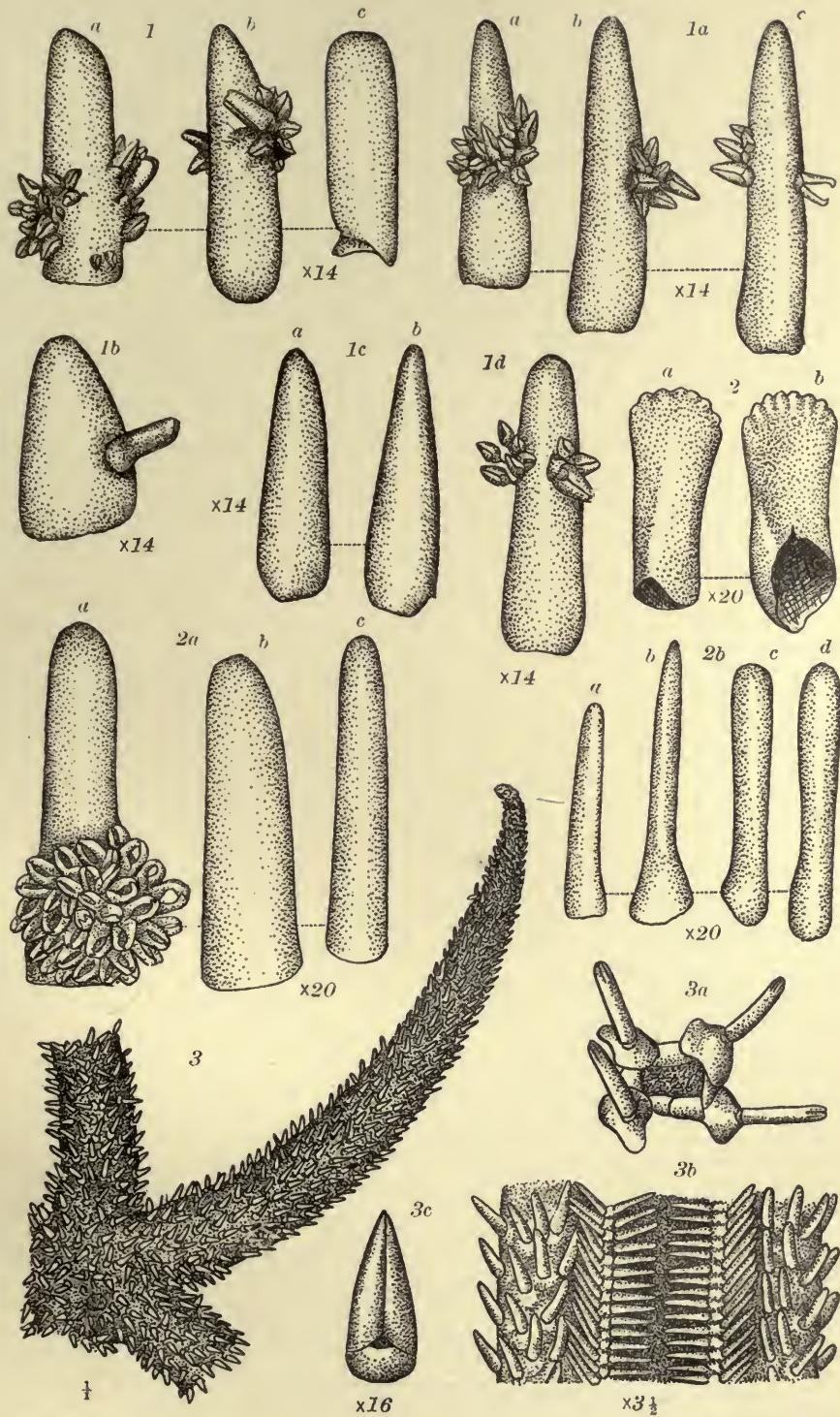


HELIOTYPE CO., BOSTON

1-3a. *Pycnopodia helianthoides* (Br.) YOUNG4. *Stenasterias macropora* VER.5. *Leptychaster pacificus* FISHER6. *P. helianthoides* (Br.)

PLATE LXXV.

- FIGS. 1-1d. *Orthasterias merriami* Verrill. Spines and pedicellariae from No. 1181; 1, a, b, c, and 1c, ordinary dorsal spines; 1a, a, b, c, marginal spines; 1c, adambulacral spines; 1b, a stout dorsal with a major pedicellaria attached; 1d, inferomarginal; $\times 14$; No. 1181, Mus. Comp. Zoöl.
- FIGS. 2-2b. *Orthasterias dawsoni* Verrill. Type. Spines and pedicellariae, $\times 20$; 2, a, b, large valves of major pedicellariae; 2a, dorsal spines; a, with wreath of minor pedicellariae; b, c, pedicellariae removed; 2b, adambulacral spines; a, b, from inner row; c, d, from outer row.
- FIGS. 3-3c. *Orthasterias koehleri* (de Loriol) Verrill. Type. After de Loriol; 3, part of dorsal side, about natural size; 3a, four dorsal ossicles and spines; 3b, portion of actinal side, $\times 3\frac{1}{2}$; 3c, a major pedicellaria; $\times 16$.



A. HYATT VERRILL DEL.

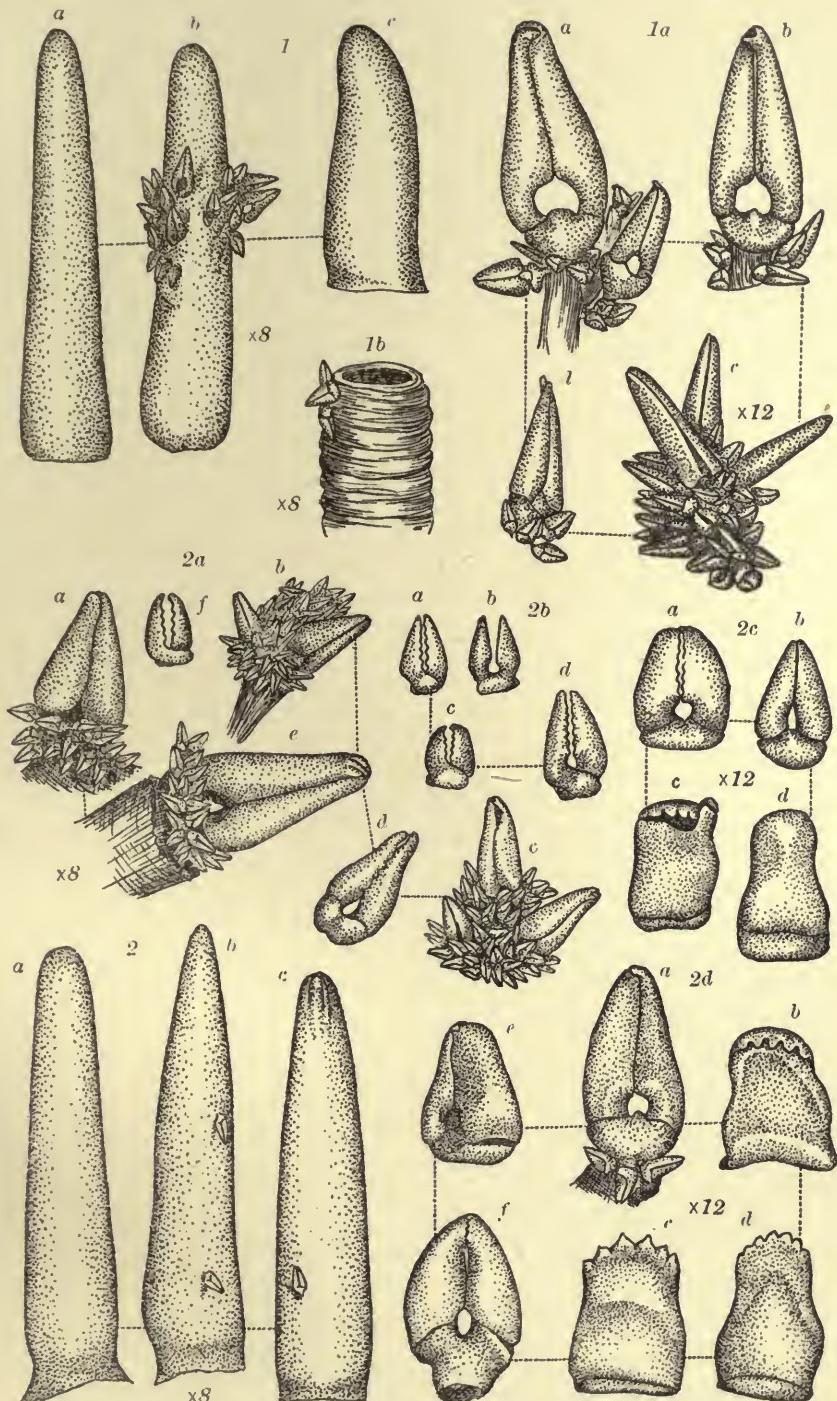
HELIOTYPE CO., BOSTON

1-1d. ASTERIAS KATHERINAE GRAY**2-2b. O. DAWSONI VER. Type****3-3c. O. KOEHLERI (LOR.) Type**

PLATE LXXVI.

FIGS. 1-1b. *Pisaster brevispinus* (Stimpson). Spines and pedicellariæ of No. 1301, Mus. Comp. Zoöl., Gulf of Georgia, $\times 8$; *a*, *b*, *c*, dorsal spines; *1a*, *b*, *c*, pedicelled clusters of adambulacral pedicellariæ, from inner edge and within the groove, consisting of both major and minor kinds, of various sizes, attached to a common pedicel; *1b*, tip of a sucker-foot with pedicellariæ attached.

FIGS. 2-2d. *Pisaster papulosus* Verrill. Type. *2*, *a*, *b*, *c*, marginal spines; *2a*, *a-e*, clusters of adambulacral or furrow pedicellariæ attached to a common pedicel and containing both sorts; *f*, a minor pedicellaria much enlarged; *2b*, *a-d*, minor pedicellariæ more enlarged; *2c*, *a-d*; and *2d*, *b-f*, dorsal and lateral large dermal major pedicellariæ of several forms; *2d*, *a*, is an adambulacral group.



A. HYATT VERRILL, DEL

HELIOTYPE CO., BOSTON

1-1b. *PISASTER PAPULOSUS* Ver. Var.
2-2d. *P. PAPULOSUS* Ver. Type

PLATE LXXVII.

- FIGS. 1-1d. *Orthasterias forreri* (Loriol) Verrill. Spines and pedicellariæ; 1, a, dorsal spine with pedicellariæ removed, $\times 8$; 1, b, lower marginal; c, upper marginal; d, outer adambulacral; e, inner adambulacral spine; $\times 17$; f, g, h, some of the detached minor pedicellariæ; 1a, two of the minor pedicellariæ grasping a fiber of hemp from the tangles; 1b, 1c, dermal minor pedicellariæ from the dorsal side, $\times 17$; 1d, a-f, dermal major pedicellariæ from dorsal and lateral areas.
- FIG. 2. *Orthasterias leptolena* Verrill. Type. Major pedicellariæ; a-d, four varieties from the dorsal and lateral areas; $\times 17$.
- FIG. 3. *Allasterias forficulosa* Verrill. Minor pedicellariæ; a, with valves united; b, c, detached valves; $\times 146$.
- FIG. 3a. The same; a, b, c, detached valves of major pedicellariæ; $\times 74$.

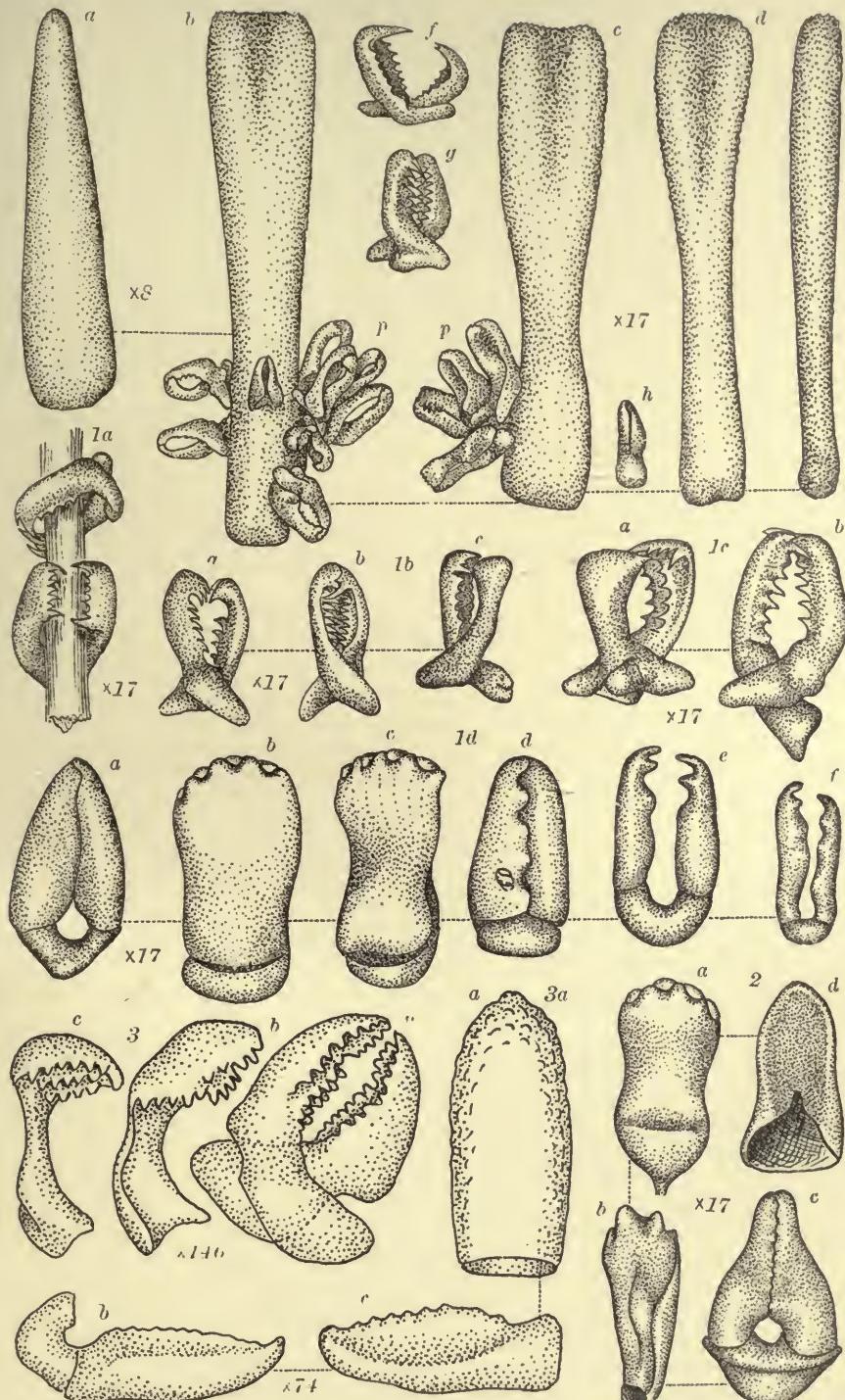
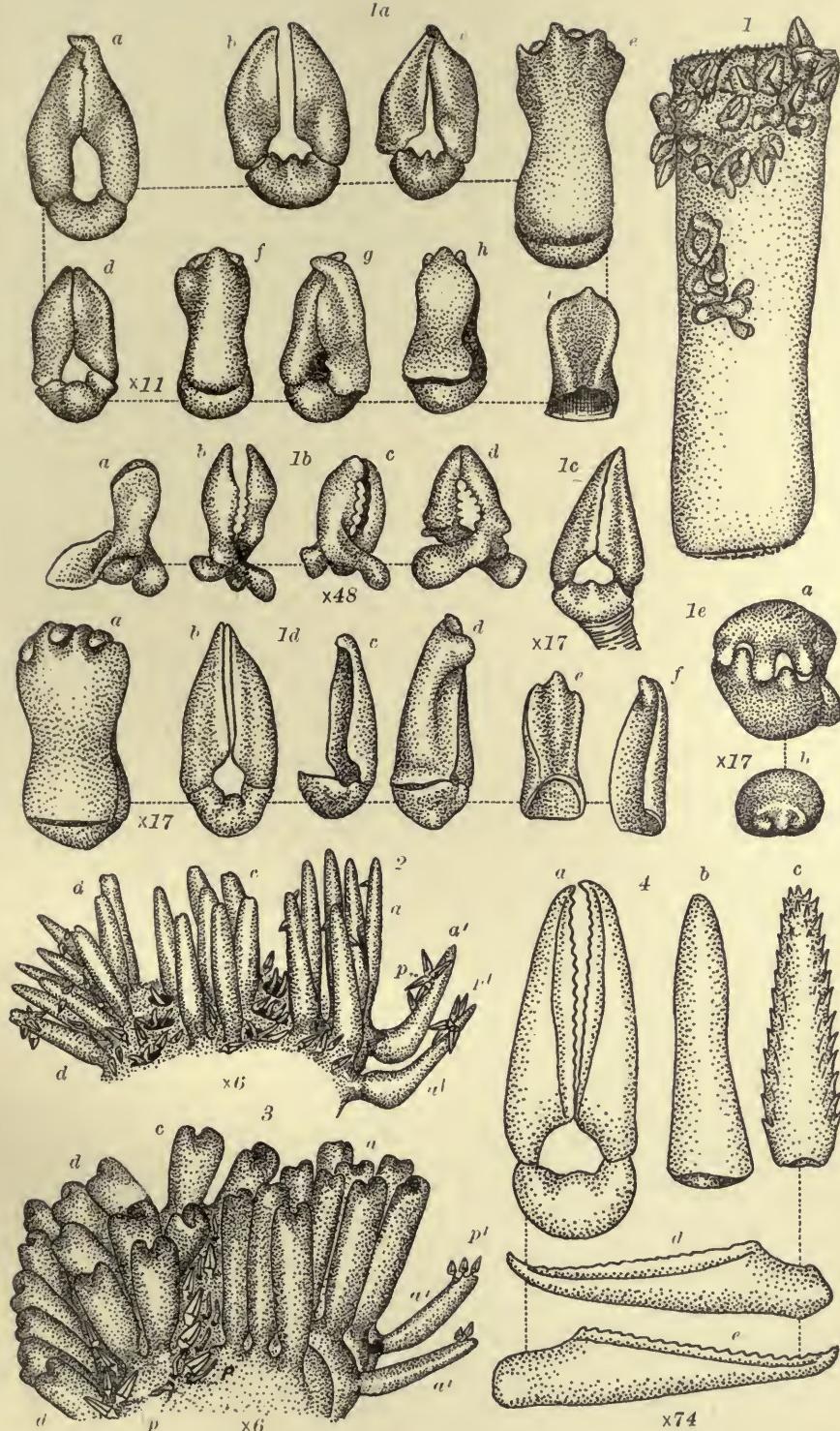
1-1d *ORTHASTERIAS (STYLASTERIAS) FORRERI* (LOR.)2. *O. LEPTOLENA* VER. Type3-3a. *ALLASTERIAS ANOMALA* VER. Type

PLATE LXXVIII.

- FIG. 1. *Orthasterias columbiana* Verrill. Cotype. A dorsal spine and minor pedicellariæ from the largest specimen from Victoria; $\times 13$. Prov. Mus. British Columbia.
- FIG. 1a. The same. Type. *a-i*, large dermal major pedicellariæ from the dorsal and lateral areas; $\times 11$.
- FIG. 1b. The same. Type. *a-d*, minor pedicellariæ; $\times 48$.
- FIG. 1c. The same. A pedicelled adambulacral major pedicellaria; $\times 17$.
- FIG. 1d. The same. Type. *a-f*, major pedicellariæ from the dorsal and lateral areas; $\times 17$.
- FIG. 1e. The same. End views of two of the larger major pedicellariæ; $\times 17$.
- FIG. 2. *Allasterias Rathbuni nortonensis* Verrill. Adambulacral (*a*); peractinal (*c*); and inferomarginal (*d, d'*) groups of spines; *a', a'*, inner or furrow-spines on alternate plates; *p, p'*, papulae and dermal pedicellariæ; *p', p'*, adambulacral pedicellaria; $\times 6$.
- FIG. 3. *Allasterias anomala* Verrill. Type. $\times 6$. Lettering as in fig. 2.
- FIG. 4. The same. Major pedicellariæ (*a*) and detached valves (*c-e*); $\times 74$.



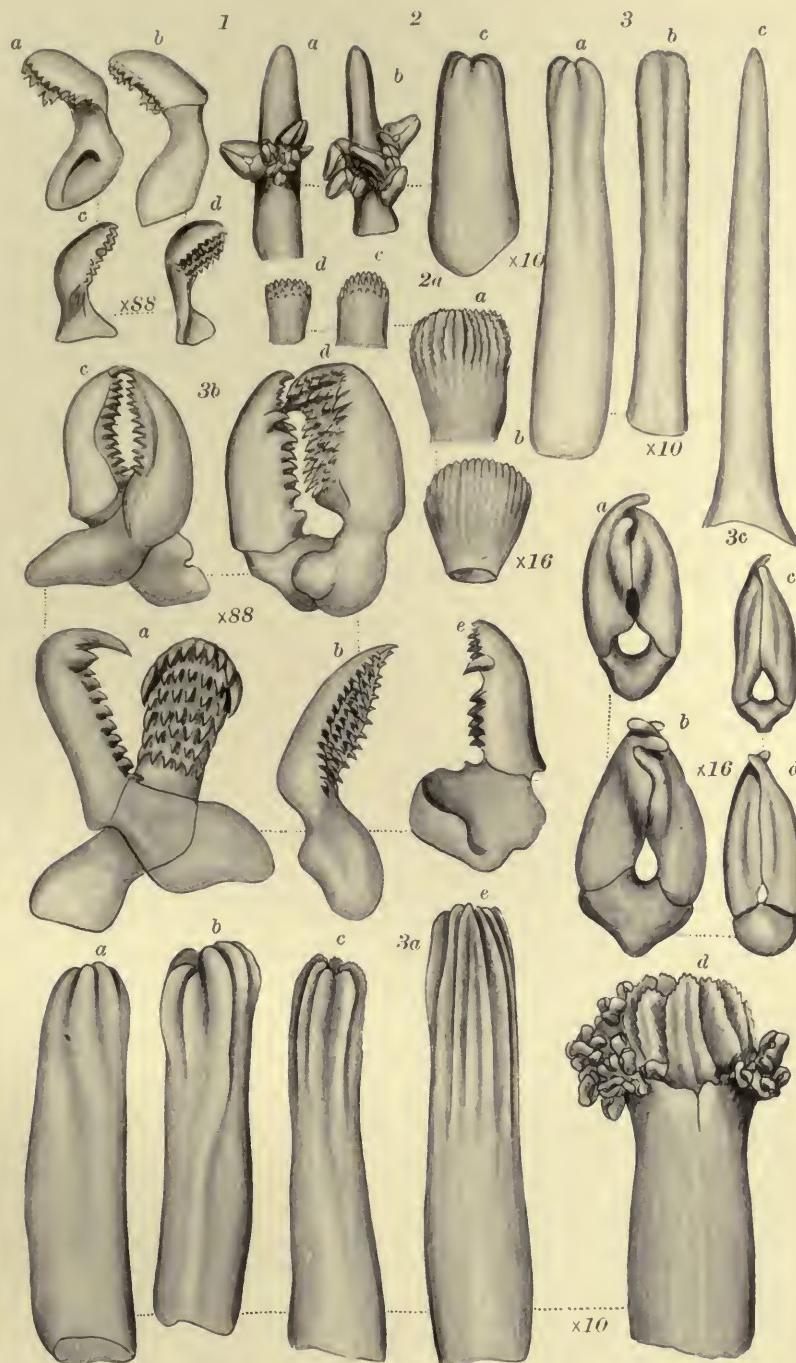
A HYATT VERRILL DEL.

HELIOTYPE CO., BOSTON

1-1e. *ORTHASTERIAS COLUMBIANA* VER. Cotype2. *ALLASTERIAS RATHBUNI NORTONENSIS* VER.3-4. *A. ANOMALA* VER. Type

PLATE LXXIX.

- FIG. 1. *Asterias polythela* Verrill. Type. Detached valves of minor pedicellariæ mounted in balsam; *a-d*; $\times 88$.
- FIG. 2. The same specimen. Spines and pedicellariæ; *a, b*, adambulacrals spines; *c*, a marginal spine with pedicellariæ removed; $\times 10$.
- FIG. 2a. The same specimen. *a-d*, larger and smaller dorsal spines; $\times 16$.
- FIG. 3. *Orthasterias columbiana* Verrill. Largest specimen from Victoria. Cotype. Spines, with pedicellariæ and skin removed; *a, b*, outer adambulacrals; *c*, inner one; $\times 10$.
- FIG. 3a. The same specimen. Spines cleaned of skin and pedicellariæ except *d*; *a, b*, dorsals; *c*, upper marginal; *d*, dorsal covered with a sheath bearing pedicellariæ near the tip; $\times 10$.
- FIG. 3b. The same specimen. Minor pedicellariæ mounted in balsam; *c, d*, entire; *a, b, e*, dislocated valves; $\times 88$.
- FIG. 3c. The same specimen. Dermal major pedicellariæ from the dorsal and lateral areas; $\times 16$.



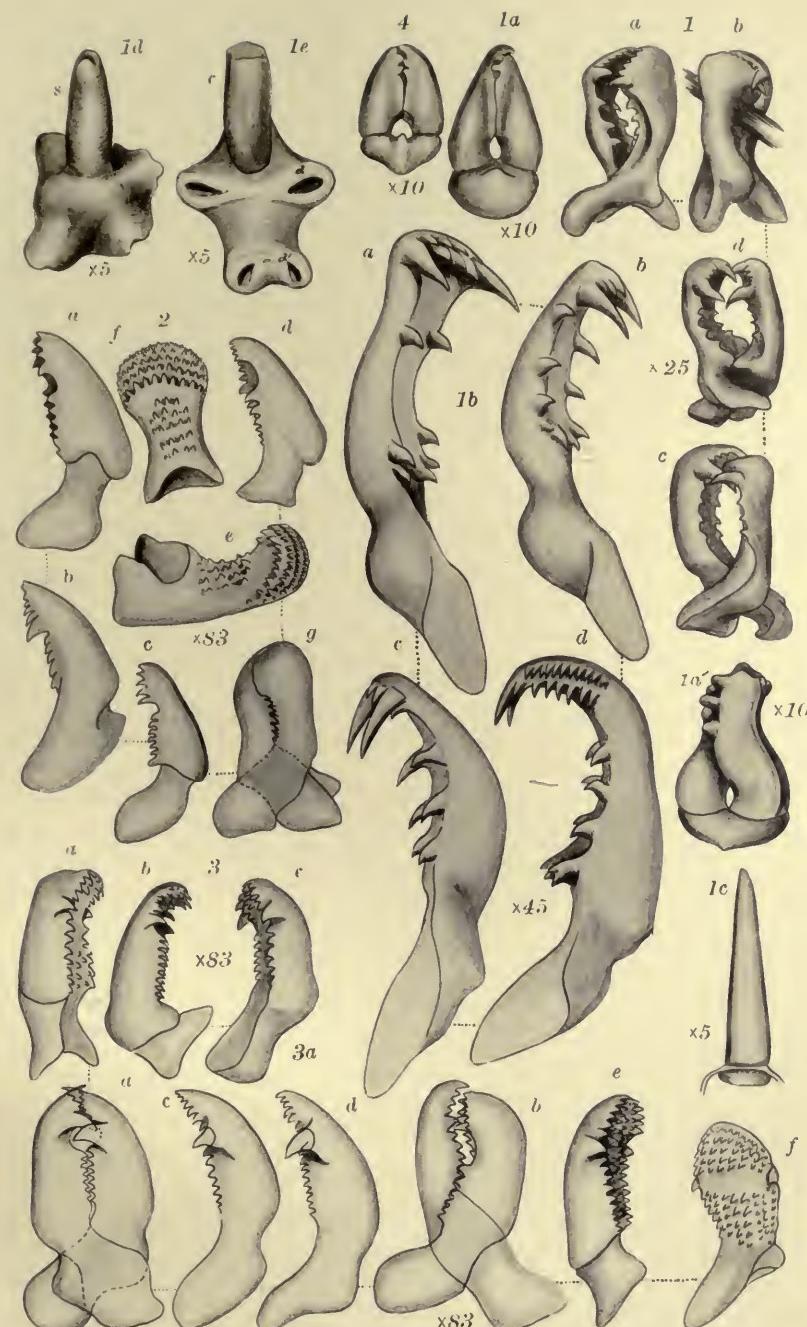
A. HYATT VERRILL DEL.

HELIOTYPE CO., BOSTON

1-2a *ASTERIAS POLYTHELA* Ver. Type
3-3c *ORTASTERIAS COLUMBIANA* Ver.

PLATE LXXX.

- FIG. 1. *Orthasterias forreri* (de Loriol) Verrill. Minor pedicellariae, *a, b, c, d*, mounted in balsam; $\times 25$.
- Figs. 1a, 1a'. The same specimen. Two large dorsal dermal major pedicellariae; $\times 10$.
- FIG. 1b. The same specimen. *a-d*, four detached valves of minor pedicellariae, mounted in balsam; $\times 45$.
- FIG. 1c. The same specimen. A cleaned dorsal spine; $\times 5$.
- Figs. 1d, 1e. The same. Dorsal plates; $\times 5$. *1d*, dorso-lateral with a spine; *1e*, carinal seen from inner side; *c*, connective ossicle; *d, d'*, facets for articulation of transverse connective ossicles.
- FIG. 2. *Orthasterias dawsoni* Verrill. Type. *a-f*, disarticulated valves of minor pedicellariae mounted in balsam; *g*, one entire; $\times 83$.
- Figs. 3, 3a. *Orthasterias californica* Verrill. Type. Minor pedicellariae mounted in balsam; *3a, a, b*, are entire; the rest, *c, f*, are disarticulated valves; $\times 83$.
- FIG. 4. *Pisaster papulosus* Verrill. Type. Major pedicellaria; $\times 10$.



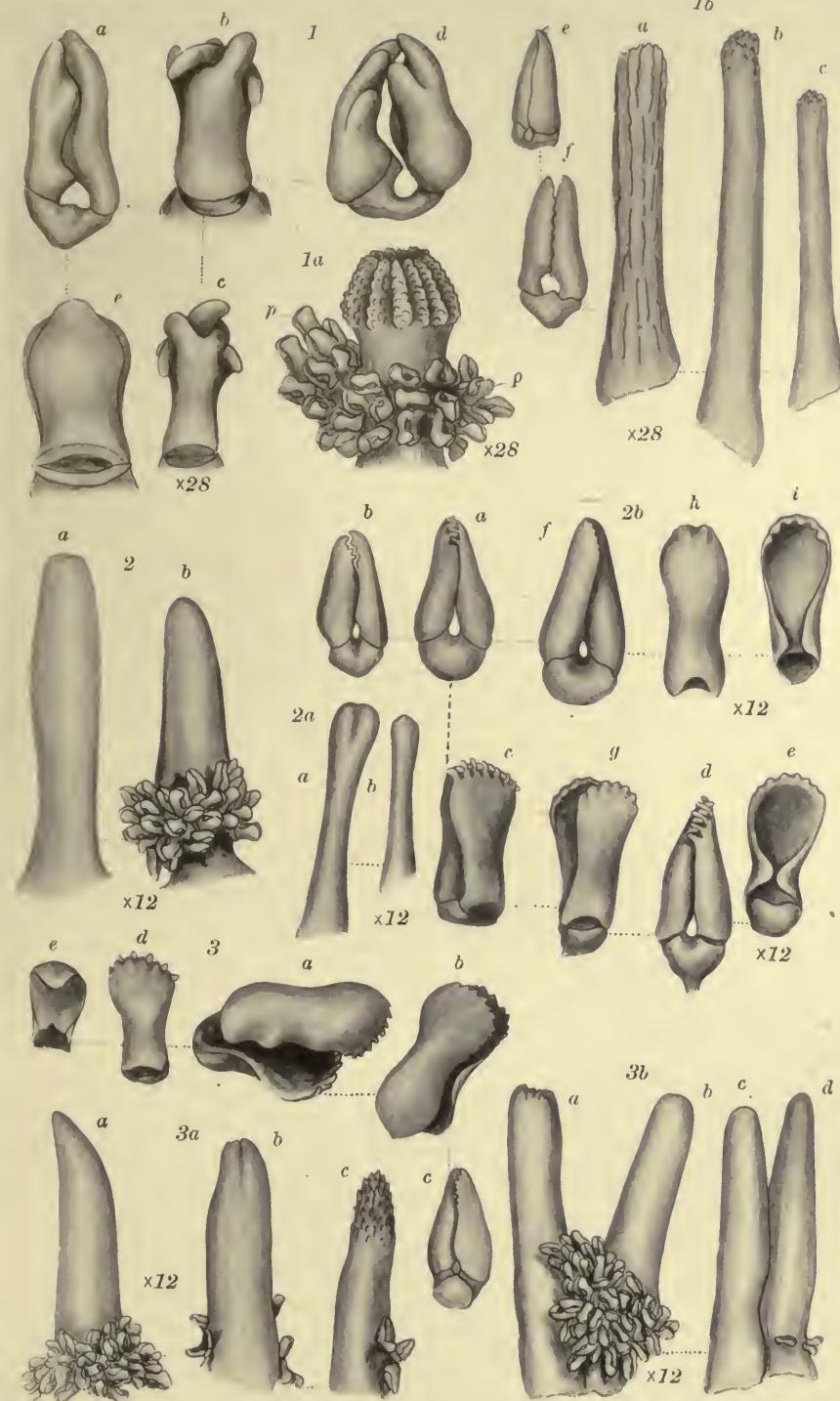
A. HYATT VERRILL DEL.

HELIOTYPE CO., BOSTON

1-1e. *ORTHASTERIAS FORRERI* (LOR.) Type2. *O. DAWSONI* VER. Type3-3a. *O. CALIFORNICA* VER. Type4. *PISASTER PAPULOSIS* VER. Type

PLATE LXXXI.

- FIG. 1. *Distolasterias chelifera* Verrill. Type. Dermal major pedicellariæ; *a*, *b*, *c*, *d*, are elongate, strongly unguiculate forms; *e* is a stouter form, and not unguiculate; $\times 28$. No. 1346, Mus. Comp. Zoöl.
- FIG. 1a. The same specimen. One of the dorsal spines bearing a wreath of minor pedicellariæ, *P*, *P*; $\times 8$.
- FIG. 1b. The same specimen. Spines cleaned; *a*, marginal spine with pedicellariæ removed; *b*, outer adambulacral; *c*, inner adambulacral; *e*, *f*, adambulacral major pedicellariæ; $\times 28$.
- FIG. 2. *Orthasterias californica* Verrill. Type. *a*, an inferomarginal spine, cleaned; *b*, a dorsal spine with a wreath of minor pedicellariæ; $\times 12$.
- FIG. 2a. The same specimen. *a*, outer; *b*, inner adambulacral spine; $\times 12$.
- FIG. 2b. The same specimen. Major pedicellariæ; *a*, *b*, *c*, *d*, *e*, dorsal; *f*, *g*, adambulacral; *h*, *i*, actinal interradial; $\times 12$.
- FIG. 3. *Orthasterias dawsoni* Verrill. Type. Dermal major pedicellariæ; *a*, *b*, stout dorsal form; *c*, *d*, *e*, more slender spatulate or plataleiform sorts from the lateral area; $\times 12$.
- FIG. 3a. The same specimen. Spines; *a*, *b*, *c*, dorsal spines treated with Javelle water to remove most of the pedicellariæ; $\times 12$.
- FIG. 3b. The same specimen. Inferomarginal spines; *a*, *b*, a pair with pedicellariæ; *c*, *d*, a smaller pair cleaned with Javelle water; $\times 12$.



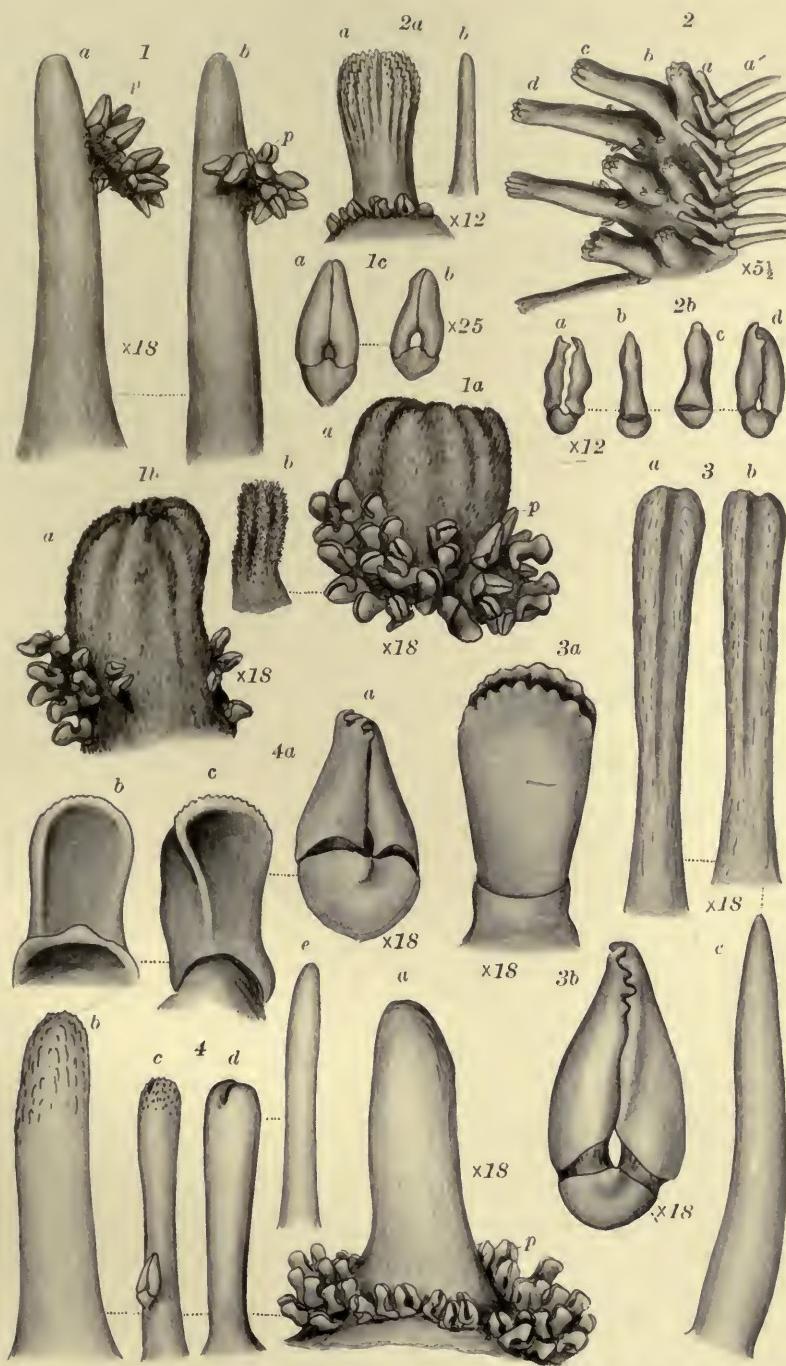
A. HYATT VERRILL DEL.

HELIOTYPE CO., BOSTON

1-1b. *DISTOLASTERIAS CHELIFERA* Ver. Type2-2b. *ORTHASTERIAS CALIFORNICA* Ver. Type3-3b. *O. DAWSONI* Ver. Type

PLATE LXXXII.

- FIG. 1. *Asterias victoriana* Verrill. Type. *a*, *b*, adambulacral spines with epispinal clusters, *p*, *p*, of pedicellariae of both sorts; $\times 18$.
- FIG. 1a. The same specimen. Dorsal spines; *a*, one of the larger, and *b*, one of the smaller sorts; *P*, minor pedicellariae; $\times 18$.
- FIG. 1b. The same specimen. An inferomarginal spine and minor pedicellariae; $\times 18$.
- FIG. 1c. The same specimen. *a*, *b*, two of the major pedicellariae; $\times 25$.
- FIG. 2. *Orthasterias biordinata* Verrill. Type. Group of spines of the actinal side; *a'*, inner, and *a*, outer adambulacrals; *b*, peractinals; *c*, *d*, inferomarginals; $\times 5\frac{1}{2}$.
- FIG. 2a. The same specimen. *a*, dorsal spine; *b*, adambulacral spine; $\times 12$.
- FIG. 2b. The same specimen. Dorsal dermal major pedicellariae, front and profile views; $\times 12$.
- FIG. 3. *Orthasterias gonolena* Verrill. Spines cleaned with Javelle water; *a*, *b*, outer adambulacrals; *c*, marginal; $\times 18$. No. 1825, Mus. Comp. Zoöl.
- FIG. 3a. The same specimen. A large denticulate dermal major pedicellaria from the lateral or intermarginal area; $\times 18$.
- FIG. 3b. The same specimen. Major pedicellaria from the outer adambulacral spines; $\times 18$.
- FIG. 4. The same specimen (No. 1825). Spines; *a*, one of the dorsal spines with a basal wreath of minor pedicellariae; *b*, inferomarginal, cleaned; *c*, *d*, outer adambulacrals; *e*, inner adambulacral; $\times 18$.
- FIG. 4a. The same; *a*, *b*, *c*, major pedicellariae; details; $\times 18$.



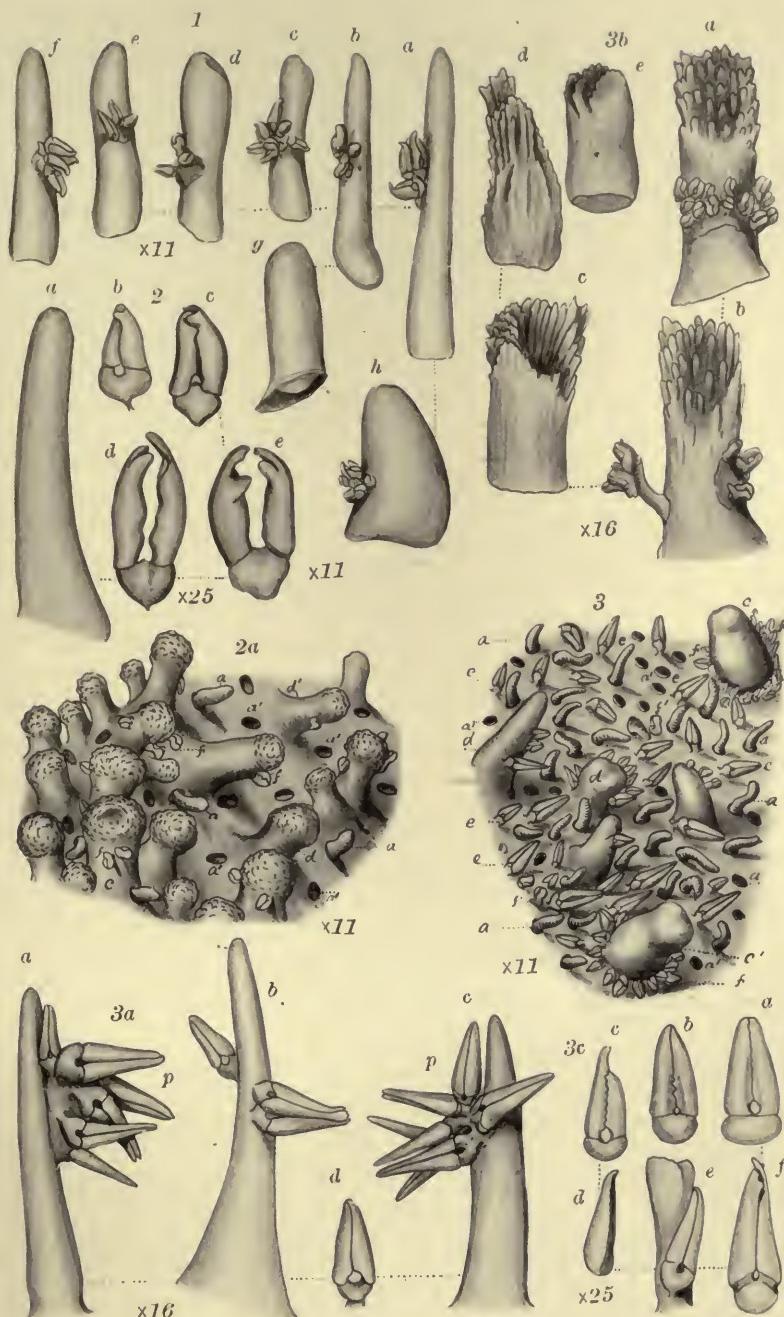
A. HYATT VERRILL DEL.

HELIOTYPE CO., BOSTON

1-1c. *ASTERIAS VICTORIANA* VER. Type2-2b. *ORTHASTERIAS BIORDINATA* VER. Type3-3b., 4., 4a. *O. GONOLENA* VER.

PLATE LXXXIII.

- FIG. 1. *Asterias katherinæ* Gray. Spines with pedicellariæ; *a*, adoral adambulacral; *b*, inner adambulacral; *c*, *d*, outer adambulacral; *e*, *f*, peractinals; *g*, *h*, inferomarginals; $\times 11$.
- FIG. 2. *Leptasterias arctica* (Murdoch). Spines and major pedicellariæ; *a*, adambulacral spine; *b*, *c*, adambulacral major pedicellariæ; *d*, axillary or interradial one; *e*, unguiculate marginal one; $\times 25$.
- FIG. 2a. The same specimen. Finer spined variety. Portion of the dorsal surface showing spines, *c*, *d*, *d'*; papulae, *a*, *a*; minor pedicellariæ, *f*, *f*; papular pores, *a'*; $\times 11$.
- FIG. 3. *Allasterias forficulosa* Verrill. Type. Portion of the dorsal surface, showing spines, *c*, *d*; papulae, *a*, *a*; papular pores, *a'*; dermal major pedicellariæ, *e*, *e*; circumspinal minor pedicellariæ, *f*, *f*; dermal minor pedicellariæ, *f'*, *f'*; $\times 11$. Japan. No. 1183. Mus. Comp. Zoöl.
- FIG. 3a. The same specimen. Adambulacral spines, *a*, *b*, *c*, and attached major pedicellariæ, *P*, *P*; *d*, one of the same, detached; $\times 16$.
- FIG. 3b. The same specimen. *a-e*, marginal spines; $\times 16$.
- FIG. 3c. The same specimen. Major pedicellariæ; *a*, *b*, *c*, *d*, dorsal dermal; *e*, marginal; *f*, axillary; $\times 25$.



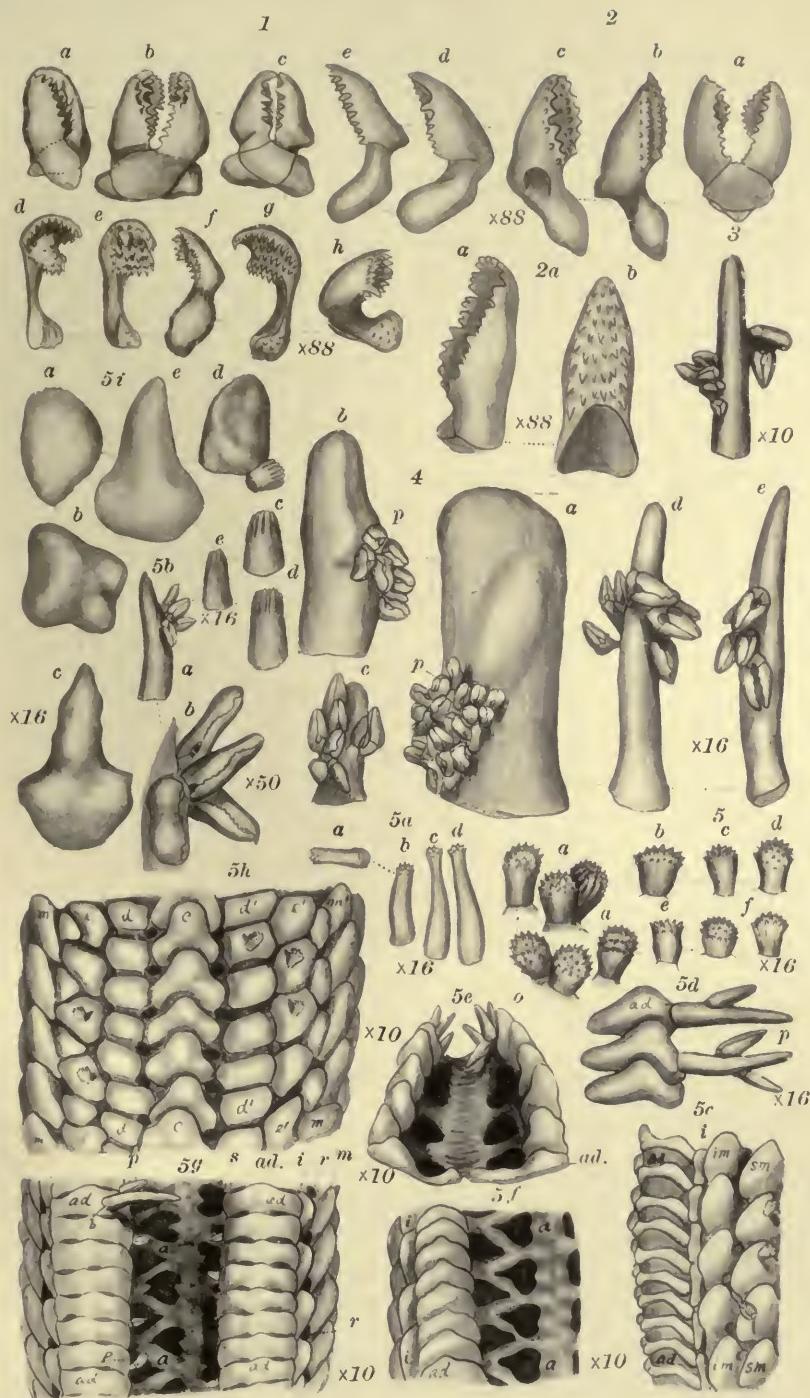
A. HYATT VERRILL DEL.

HELIOTYPE CO., BOSTON

1. *ASTERIAS KATHERINAE* GRAY2-2a. *LEPTASTERIAS ARCTICA* (MUR.)3-3c. *ALLASTERIAS FORFICULOSA* VER. Type

PLATE LXXXIV.

- FIG. 1. *Allasterias forficulosa* Verrill. Type. Minor pedicellariæ mounted in balsam; *a*, *b*, *c*, entire; *d-h*, detached valves; $\times 88$. Japan. No. 1183, Mus. Comp. Zool.
- FIG. 2. *Asterias multiclava* Verrill. Type. Minor pedicellariæ in balsam; *a*, entire; *b-c*, separated valves; $\times 88$.
- FIG. 2a. The same specimen. Dermal dorsal major pedicellariæ; *a*, *b*, separated valves; $\times 88$.
- FIG. 3. *Asterias polythela* Verrill. Type. Adambulacral spines and pedicellariæ; $\times 10$.
- FIG. 4. The same specimen. Spines with adhering pedicellariæ; *a*, *b*, *c*, dorsals; *d*, *e*, adambulacrals with major pedicellariæ; $\times 16$.
- FIG. 5. *Stenasterias macropora* Verrill. Type. *a-g*, dorsal spines, mostly from bases of rays; $\times 16$.
- FIG. 5a. The same specimen. Adambulacral spines, *a-d*; $\times 16$.
- FIG. 5b. The same specimen. *a*, adoral spine with pedicellariæ; *c*, *d*, *e*, marginal spines, $\times 16$; *b*, oral pedicellariæ, $\times 50$.
- FIG. 5c. The same. Group of ossicles of actinal side; *ad*, adambulacrals; *i*, peractinals; *im*, inferomarginals; *sm*, supramarginals; $\times 10$.
- FIG. 5d. The same. Adoral adambulacral plates (*ad*), and spine with pedicellariæ (*p*).
- FIG. 5e. The same. Adoral portion of the groove, with large pores of sucker-feet; *ad*, adambulacral plates; *o*, oral spines; $\times 10$.
- FIG. 5f. Portion of groove and plates from middle of ray; *a*, *a*, ambulacral plates and large pores; *ad*, adambulacral plates; *i*, peractinals; $\times 10$.
- FIG. 5g. The same. Segment of actinal side of a ray deprived of spines; *a*, *a*, ambulacral plates and large sucker pores (*s*); *a*, *d*, adambulacral plates; *i*, peractinals; *m*, inferomarginal; *b*, a remaining adambulacral spine; *p*, *p*, adambulacral pedicellariæ; *r*, *r*, papular pores; $\times 10$.
- FIG. 5h. The same. Dorsal side of ray, with spines removed; *c*, *c*, median or carinal row of plates; *d*, *d*, and *d' d'*, right and left secondary rows of plates; *e*, *e'*, second pair of secondary rows of plates; *m*, *m'*, superomarginal rows; single papular pores lie between the plates in rows; $\times 10$.
- FIG. 5i. The same. Skeletal ossicles; *a*, peractinal plate; *b*, superomarginal; *c*, inferomarginal; *d*, adambulacral; *e*, superomarginal; $\times 16$.



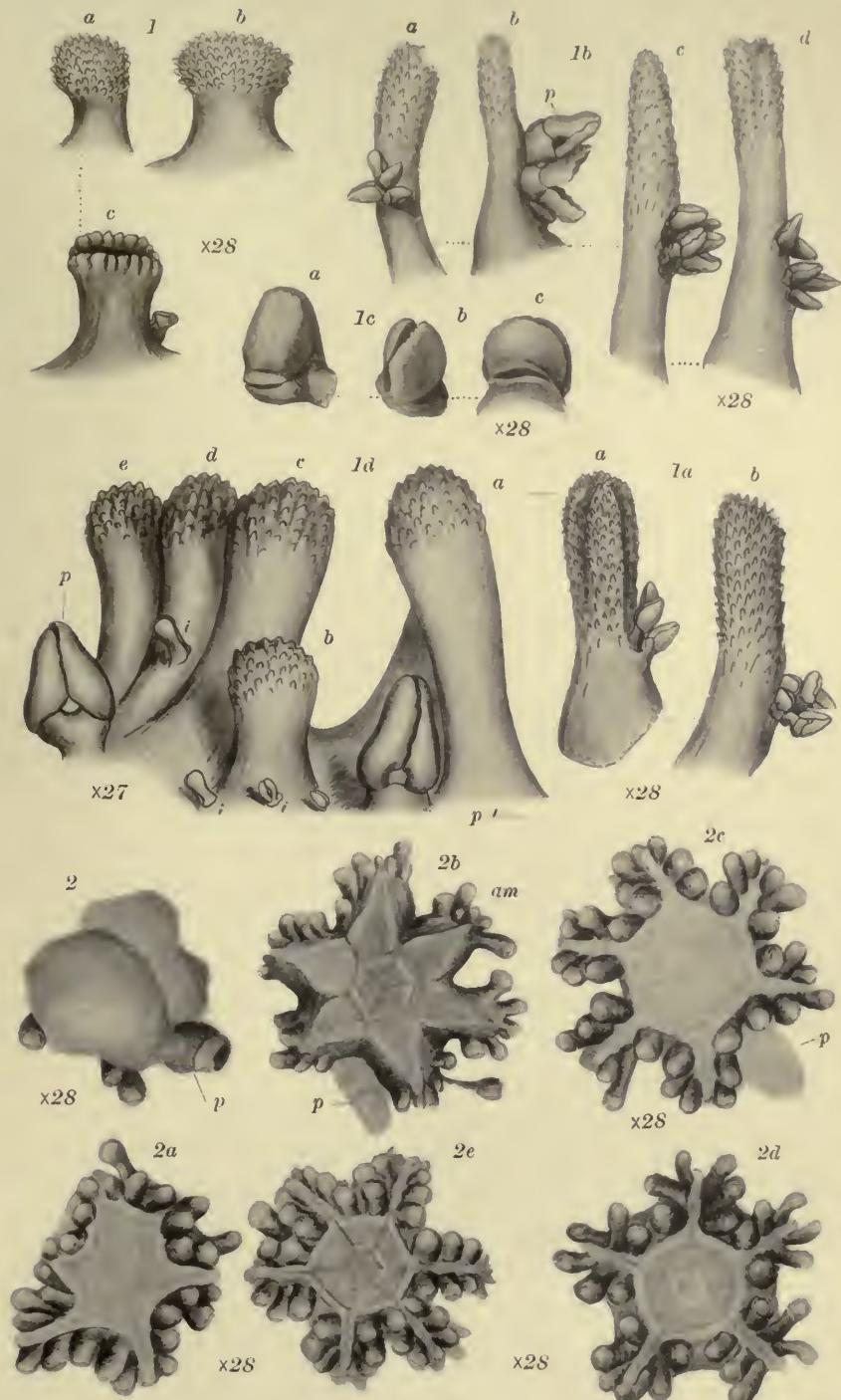
A. HYATT VERRILL DEL.

HELIOTYPE CO., BOSTON

1. *ALLASTERIAS FORFICULOSA* VER. Type2-2a. *ASTERIAS MULTICLAVA* VER. Type3-4. *A. POLYTHELA* VER. Type5-5i. *STENASTERIAS MACROPORA* VER. Type

PLATE LXXXV.

- FIG. 1. *Leptasterias epichlora alaskensis* Verrill. Type. Dorsal spines, *a*, *b*, *c*, of different sorts; $\times 28$. Dutch Harbor.
- FIG. 1a. The same specimen; *a*, inferomarginal spine; *b*, superomarginal; $\times 28$.
- FIG. 1b. The same specimen; *a*, *b*, *c*, adambulacral spines; *d*, peractinal; $\times 28$.
- FIG. 1c. The same specimen; *a*, *b*, *c*, large, erect, intermarginal major pedicellariæ; $\times 28$.
- FIG. 1d. The same specimen; marginal spines and pedicellariæ; *a*, superomarginal spines; *b*, *c*, *d*, *e*, inferomarginals; *p*, *p'*, major pedicellariæ; *i*, *i'*, minor pedicellariæ.
- FIGS. 2-2e. The same. Young carried by parent, in different stages of growth; *a*, *b*, younger stages; *p*, pedicel for attachment; *a*, *m*, podia or ambulacral feet; $\times 28$. In 2, the form is irregular, with few podia; in 2a, the form has become stellate, but with unequal rays. Later stages are regularly stellate; 2d is five-rayed; the others are six-rayed like the parent.



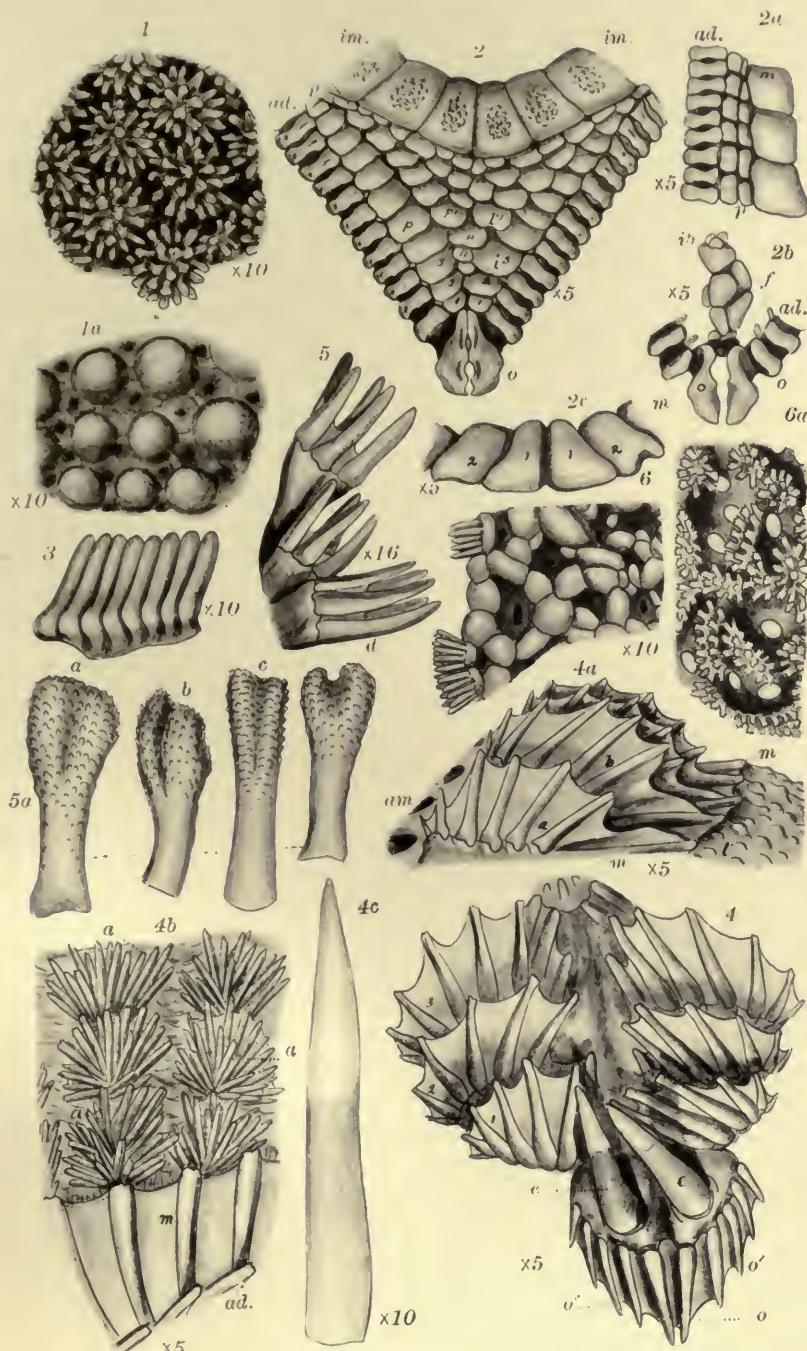
A. HYATT VERRILL DEL.

HELIOTYPE CO., BOSTON

LEPTASTERIAS EPICHLORA ALASKENSIS VER. Type.
AND YOUNG OF THE SAME

PLATE LXXXVI.

- FIG. 1. *Bunodaster ritteri* Verrill. Type. A group of dorsal parapaxillæ from the base of a ray; $\times 10$.
- FIG. 1a. The same specimen. A group of dorsal plates from the base of a ray, with spines removed; $\times 10$.
- FIG. 2. *Dermasterias imbricata* (Grube). Young. One of the interactinal areas deprived of spines; *ad*, adambulacral plates, *o*, jaw plates; *im*, inferomarginals; *p*, *p*, first rows; *P*, *P*', second rows of interactinal plates; *i*, *i* and *2*, *2* and *3*, *3*, first three pairs of interactinal plates; *u*, *u*, odd or unpaired plates; $\times 5$.
- FIG. 2a. The same specimen; *ad*, adambulacral plates from near base of ray; *p*, two rows of interactinal plates; *m*, inferomarginals; $\times 5$.
- FIG. 2b. The same specimen; *o*, *o*, jaw-plates; *ad*, adoral adambulacrals; *f*, rudimentary plates, perhaps superambulacral; *ib*, interbrachial septum; $\times 5$.
- FIG. 2c. The same specimen. Supramarginal plates, from inner side; *i*, *i* and *2*, *2*, first and second interradial pairs; $\times 5$.
- FIG. 3. *Solaster stimpsoni* Verrill. Type. One of the adambulacral combs of spines.
- FIG. 4. *Pteraster tessellatus* Ives. A jaw and adoral parts; *o*, *o*, apical oral spines; *o'*, *o'*, lateral oral spines; *e*, *e*, hyaline epioral spines; *i*, *2*, *3*, first three pairs of adambulacral combs; $\times 5$.
- FIG. 4a. The same specimen. Portion from near middle of radial area; *am*, ambulacral groove; *a-d*, four combs of adambulacral spines; *m*, *m*, actinomarginal spines; *l*, latero-ventral surface; $\times 5$.
- FIG. 4b. The same specimen. Part of an interbrachial area, rendered translucent by varnish; *a*, *a*, *a*, spinules of parapaxillæ as seen through the translucent skin; *m*, actinomarginal spines; *ad*, adambulacrals; $\times 5$.
- FIG. 4c. The same. One of the hyaline epioral spines; $\times 10$.
- FIG. 5. *Henricia sanguinolenta* var. *rudis* Verrill. A group of dorsal pseudopaxillæ from the base of a ray; $\times 16$. Point Franklin. No. 7623.
- FIG. 5a. The same specimen. *a-d*, adambulacral spines; $\times 16$.
- FIG. 6. *Henricia tumida borealis* Verrill. Type. A group of dorsal ossicles, mostly with spinules removed from the base of a ray; $\times 10$.
- FIG. 6a. The same specimen. Group of dorsal pseudopaxillæ, with spinules and papular pores; $\times 10$. Alaska, Harriman Expedition.



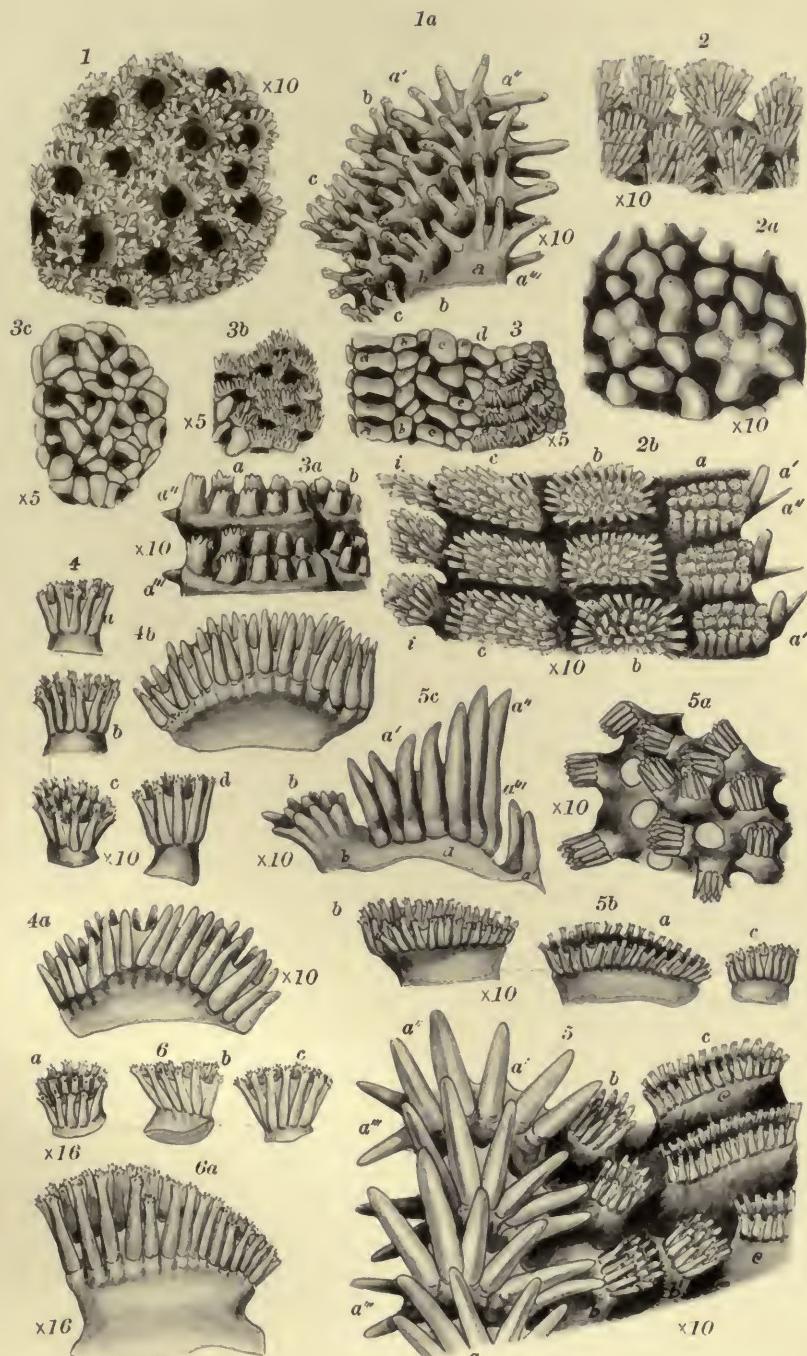
A. HYATT VERRILL DEL.

HELIOTYPE CO., BOSTON

- 1-1a. *BUNODASTER RITTERI* Ver. Type
- 2-2c. *DERMASTERIAS IMBRICATA* (GRUBE)
3. *SOLASTER STIMPSONI* Ver. Type
- 4-4c. *PTERASTER TESSELATUS* Ives
- 5-5a. *HENRICIA SANGUINOLENTA*, VAR *RUDIS* Ver.
- 6-6a. *H. TUMIDA BOREALIS* Ver. Type

PLATE LXXXVII.

- FIG. 1. *Henricia tumida* Verrill. Type. Portion of dorsal surface; $\times 10$.
- FIG. 1a. The same specimen. Group of spines of actinal side; a', a' , adambulacrals; b, b' , peractinals; c, c' , inferomarginals; $\times 10$.
- FIG. 2. *Henricia leviuscula spiculifera* (Clark). Group of pseudopaxillæ from the side of the base of a ray; $\times 10$. Bering Sea.
- FIG. 2a. The same specimen. Group of dorsal ossicles with spines removed; $\times 10$.
- FIG. 2b. The same specimen. Portion of actinal side; a, a' , adambulacral plates and spines; a'', a'' , furrow-spine; b, b , peractinal pseudopaxillæ; c, c , inferomarginals; d, d , superomarginals; $\times 10$.
- FIG. 3. *Henricia arctica* Verrill. Type. Cape Lisburne. Portion of actinal side with spines partly removed; a, a , adambulacral plates; b, b , peractinals; c, c , inferomarginals; d, d , superomarginals; e, e , intermarginals; $\times 5$.
- FIG. 3a. The same specimen. a, a , two adambulacral plates and spines; a' , furrow-spine; b , peractinal.
- FIG. 3b. The same specimen. Group of dorsal pseudopaxillæ; $\times 5$.
- FIG. 3c. The same specimen. Group of ossicles from base of ray; $\times 5$.
- FIG. 4. *Solaster endeca* (Linn.) Forbes. Typical from Atlantic; a, b, c , dorsal pseudopaxillæ from base of ray; d , superomarginal; $\times 10$.
- Figs 4a, 4b. The same specimen. Inferomarginal plates; 4a, adoral side; 4b, aboral side; $\times 10$.
- FIG. 5. *Solaster galaxides* Verrill. Type. Portion of actinal side; a, a , adambulacral spines, actinal group; a' , furrow-spines; b, b, b' , peractinals; c, c , inferomarginals.
- FIG. 5a. The same specimen. Group of dorsal pseudopaxillæ and papular pores from the base of a ray; $\times 10$.
- FIG. 5b. The same specimen; a , adoral, and b , aboral sides of inferomarginal plates; c , superomarginal plate; $\times 10$.
- FIG. 5c. *Solaster galaxides* Verrill. Cotype. a , actinal group of adambulacral spines; a' , furrow-spines; b , peractinals. No. 1897, Mus. Comp. Zool.
- FIG. 6. *Solaster dawsoni* var. *arctica* Verrill. Type. Dorsal pseudopaxillæ, a, b, c , from base of ray; $\times 16$.
- FIG. 6a. The same specimen; inferomarginal plate; $\times 16$. From Point Franklin.



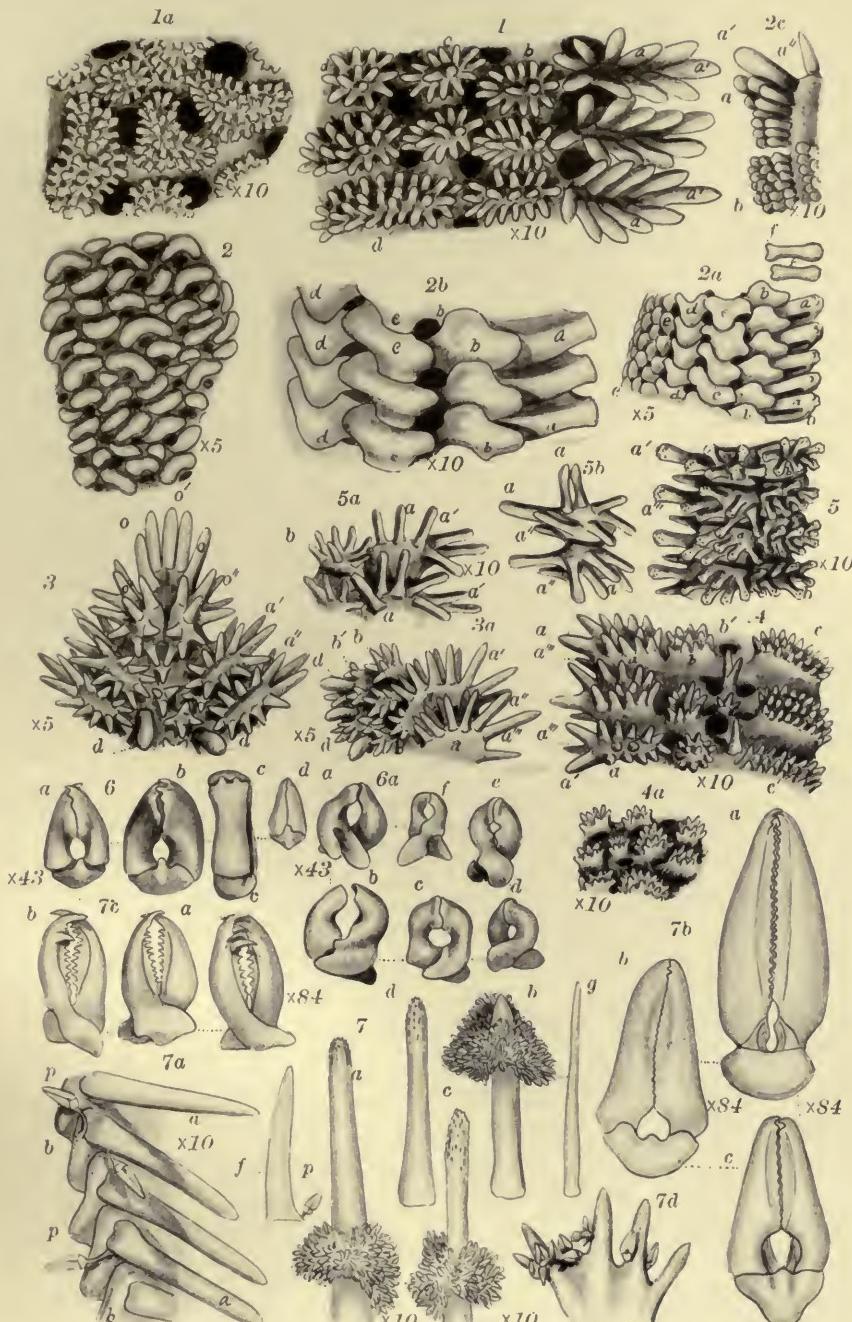
A. HYATT VERRILL DEL.

HELIOTYPE CO., BOSTON

1-1a. *HENRICIA TUMIDA* VER. Type2-2b. *H. LEVIUSCULA SPICULIFERA* (CLARK)3-3c. *H. ARCTICA* VER. Type4-4b. *SOLASTER ENDECA* (L.)5-5c. *S. GALAXIDES* VER. Type6-6a. *S. DAWSONI ARCTICUS* VER. Type

PLATE LXXXVIII.

- FIG. 1.** *Henricia leviuscula* var. *inequalis* Verrill. Type. Portion of the actinal side of a ray; *a, a*, enlarged adambulacral spines; *a', a'*, longer adambulacral spines on inner angle of plate; *b*, interactinals; *c*, second row of interactinal pseudopaxillæ; *d*, inferomarginal plates and spines; $\times 10$. No. 5183, Yale Mus.
- FIG. 1a.** The same specimen. Group of dorsal pseudopaxillæ and papulae from base of a ray; $\times 10$.
- FIG. 2.** *Henricia leviuscula* var. *lunula* Verrill. Type. Group of dorsal ossicles from the base of a ray, cleaned; $\times 5$. British Columbia. Yale Mus.
- FIG. 2a.** The same specimen. Plates of the actinal side of the middle of a ray, cleaned; *a, a*, adambulacrals; *b, b*, peractinals; *c, c*, inferomarginals; *d, d*, superomarginals; *e, e*, latero-dorsals; *f*, two adambulacral spines; $\times 5$.
- FIG. 2c.** The same specimen. Plates of actinal side, more enlarged ($\times 10$). Lettering as in fig. 2a.
- FIG. 2c.** The same specimen; *a*, adambulacral spines; *a'*, enlarged inner spine; *a''*, furrow-spine; *b*, peractinal spines; $\times 10$.
- FIG. 3.** *Henricia sanguinolenta* (Müller). Typical form from New England. A jaw and adjacent parts; *o, o, o'*, apical or peroral spines; *o'', o''*, lateral adoral spines; *a, a''*, adambulacral spines of first and second free plates; *d, d*, exsert papulae; $\times 5$. Eastport, Me. (coll., A. E. Verrill). Yale Mus., No. 5099.
- FIG. 3a.** The same specimen. Spines from the actinal side near the base of a ray; *a, a*, adambulacral plates; *a', a''*, adambulacral spines; *a'''*, furrow spine; *b, b'*, interactinal spines; *d, d*, papulae; $\times 5$.
- FIG. 4.** *Henricia sanguinolenta miliaris* Verrill. Type. From a New England specimen. A portion of the actinal surface of the middle of a ray; $\times 10$. Lettering as in fig. 3a, with addition of *c, c*, the inferomarginal plates.
- FIG. 4a.** The same specimen. Group of dorsal pseudopaxilla from near base of a ray; $\times 10$. Eastport, Me. (coll., A. E. Verrill). Yale Mus.
- FIG. 5.** *Henricia tumida borealis* Verrill. Type. Portion of plates and spines from the actinal side near the base of a ray; $\times 10$. Lettering as in figs. 3a and 4. Dutch Harbor, Alaska, Harriman Expedition. Yale Mus.
- FIG. 5a.** The same specimen. *a, a*, ambulacral spines; *a', a'*, larger spines on edge of groove; *b, b*, peractinal spines; $\times 10$.
- FIG. 5b.** The same specimen. Adoral adambulacral plates and spines; $\times 10$. Lettering as in fig. 5a.
- FIG. 6.** *Orthasterias forsteri forcipulata* Verrill. Type. Larger dorsal, dermal, major pedicellariae of three sorts; *a, b*, stout, erect denticulate form; *c*, spatulate or plataleiform sort; *d*, lanceolate form; $\times 43$.
- FIG. 6a.** The same specimen. Minor pedicellariae of different sizes, *a-f*; $\times 43$.
- FIG. 7.** *Pycnopodia helianthoides* (Brandt). Spines; *a, b, c*, dorsals with wreaths of minor pedicellariae; *d*, the same, cleaned of the pedicellariae; *f*, an adambulacral spine with a pedicellaria (*P*) attached to its base by a pedicel on the edge of the furrow; *g*, an adoral spine, cleaned; $\times 10$.
- FIG. 7a.** The same specimen. A group (*b, b*) of adambulacral overlapping plates; *a, a*, adambulacral spines; *p, p*, major pedicellariae on slender pedicels; $\times 10$.
- FIG. 7b.** The same specimen. *a, b, c*, three forms of small lanceolate major pedicellariae; $\times 84$.
- FIG. 7c.** The same specimen. *a, b, c*, three of the minor pedicellariae; $\times 84$.
- FIG. 7d.** The same specimen. One of the jaws with apical or peroral spines and pedicellariae; $\times 10$.



A. HYATT VERRILL DFL.

HELIOTYPE CO., BOSTON

- 1-1a. *HENRICIA LEVIUSCULA*, VAR.
 2-2c. *H. LEVIUSCULA*, VAR. *LUNULA* VER. Type
 3-3a. *H. SANGUINOLENTA* (MULL.) Typical
 4-4a. *H. SANGUINOLENTA MILIARIS* VER. Type
 5-5b. *H. TUMIDA BOREALIS* VER. Type
 6-6a. *ORTIASTERIAS FORRERI FORCIPULATA* VER. Type
 7-7d. *PYCNOPODIA HELIANTHOIDES* (BR.)

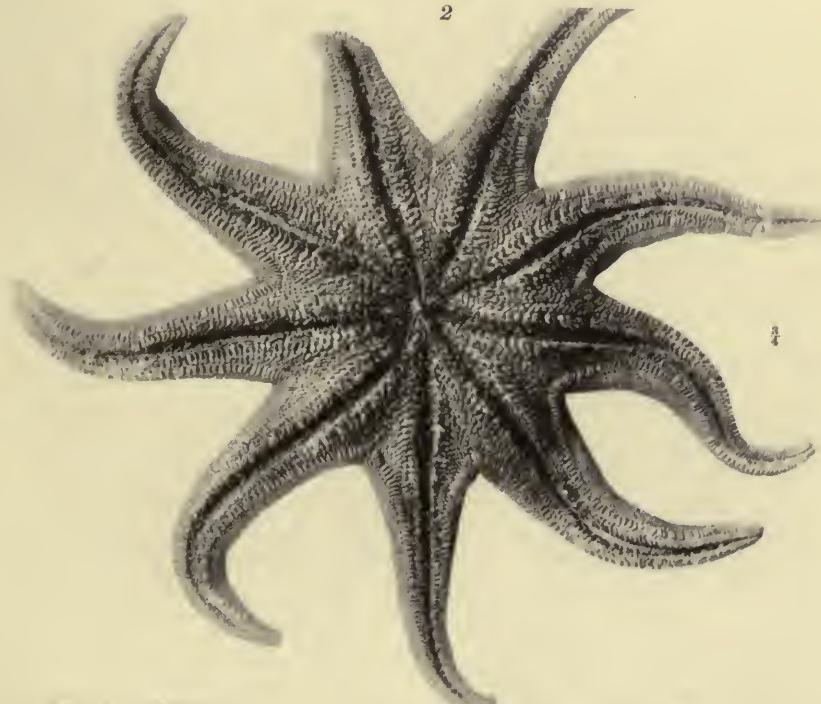
PLATE LXXXIX.

FIG. 1. *Solaster endeca* (Linn.) Forbes. Typical. Actinal side of a large New England specimen; $\frac{4}{9}$ natural size. Eastport, Me. Yale Mus.

FIG. 2. *Solaster galaxides* Verrill. Type. $\frac{3}{4}$ natural size. Vancouver Is.



1



2

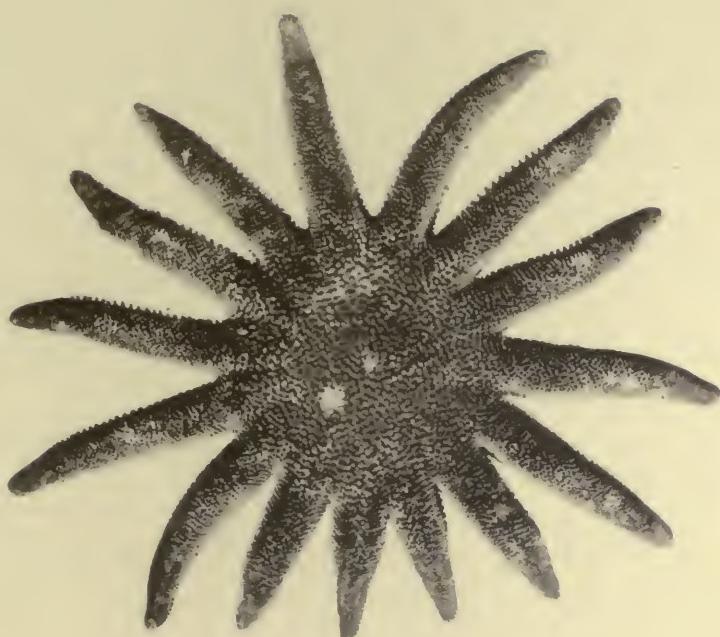
HELIOTYPE CO., BOSTON

1. SOLASTER ENDECA (L.) ATLANTIC
2. S. GALAXIDES VER. Type

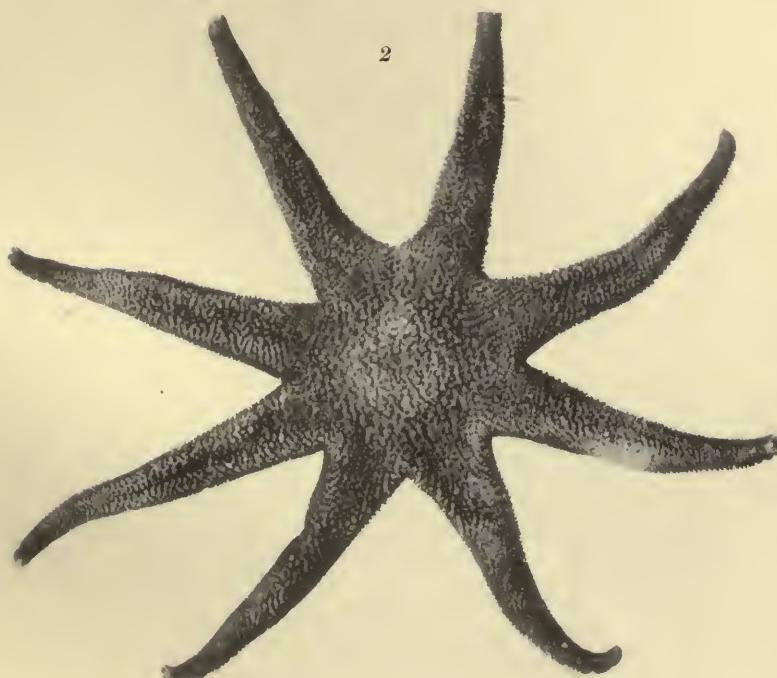
PLATE XC.

- FIG. 1. *Solaster dawsoni* Verrill. Form with different rays; about natural size. Vancouver I., Surv. Canada.
- FIG. 2. *Solaster constellatus* Verrill. Type. About $\frac{3}{4}$ natural size.

1



2

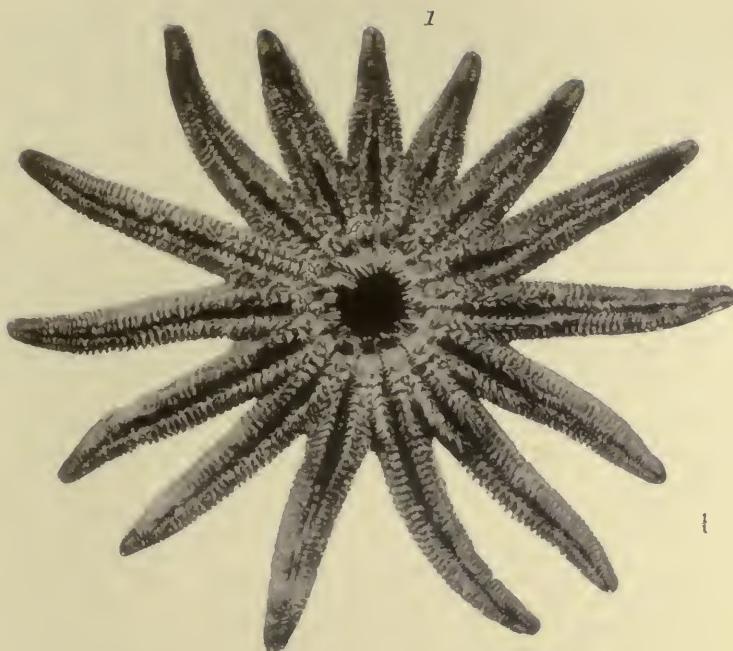


HELIOTYPE CO., BOSTON

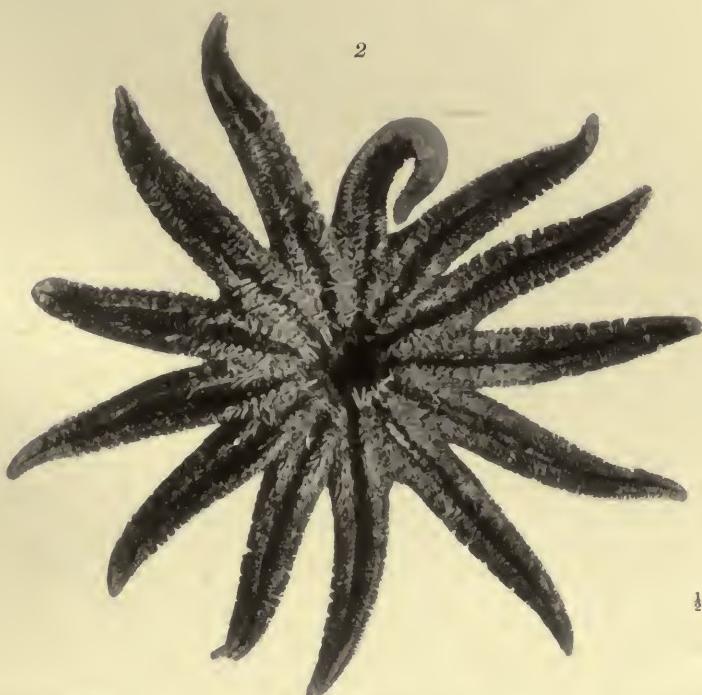
1. SOLASTER DAWSONI VER.
2. SOLASTER CONSTELLATUS VER. Type

PLATE XCI.

- FIG. 1. *Solaster dawsoni* Verrill. Form with fifteen rays. Actinal side; about natural size.
- FIG. 2. *Solaster dawsoni* Verrill. Cotype. Actinal side; about $\frac{1}{2}$ natural size. Powell Is. Geol. Surv. Canada.



1



2

$\frac{1}{2}$

HELIOTYPE CO., BOSTON

1.2. SOLASTER DAWSONI VER.

PLATE XCII.

FIG. 1. *Solaster dawsoni* Verrill. Cotype. Same specimen as pl. xc, fig. 2.
Actinal side; $\times 2\frac{3}{4}$. Powell Is.

(186)

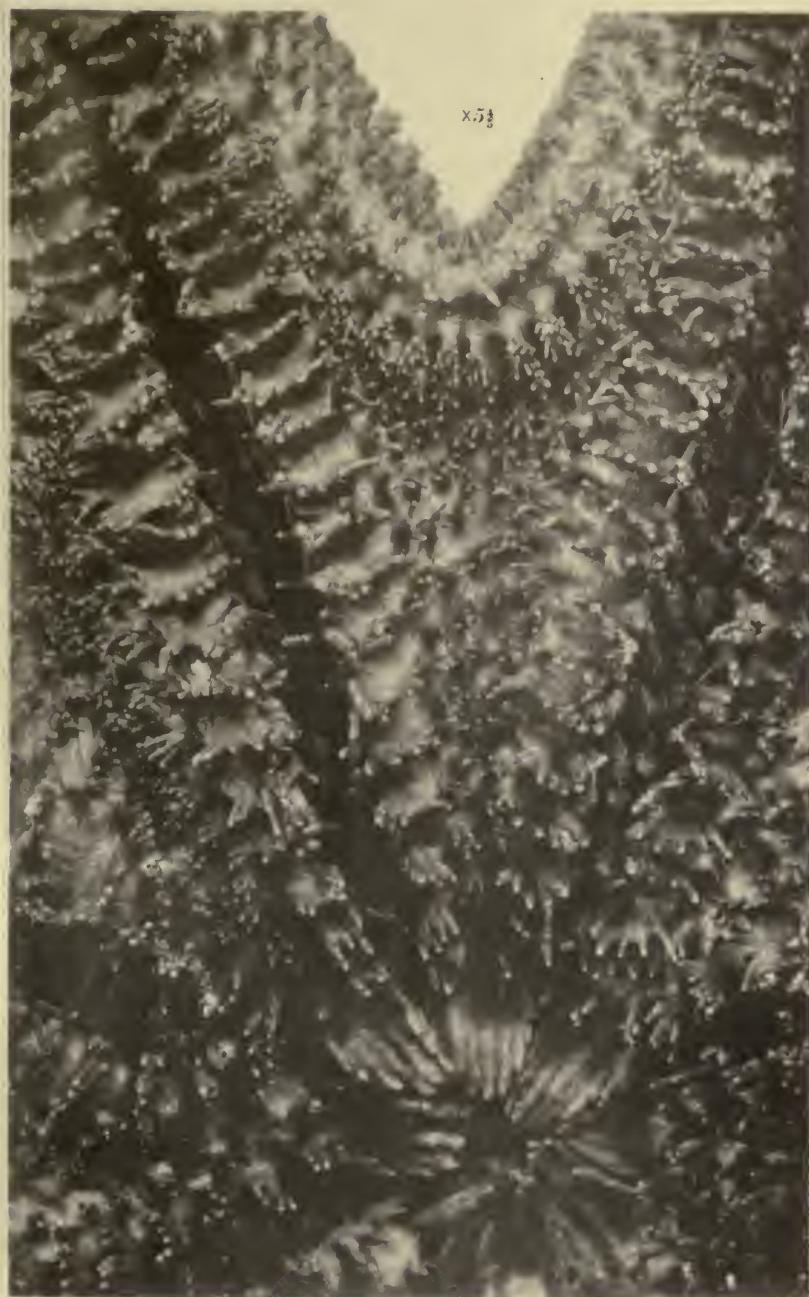


HELIOTYPE CO., BOSTON

SOLASTER DAWSONI VER. Cotype

PLATE XCIII.

FIG. 1. *Solaster constellatus* Verrill. Type. Actinal side; $\times 5\frac{1}{2}$. Puget Sound. Mus. Univ. of Wash.



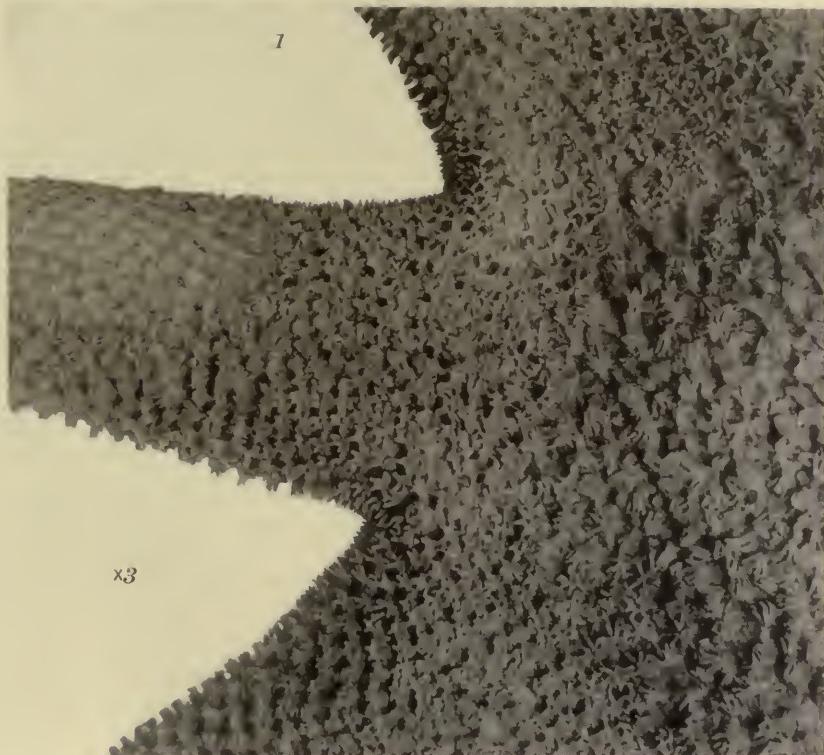
HELIOTYPE CO., BOSTON

SOLASTER CONSTELLATUS VER. Type

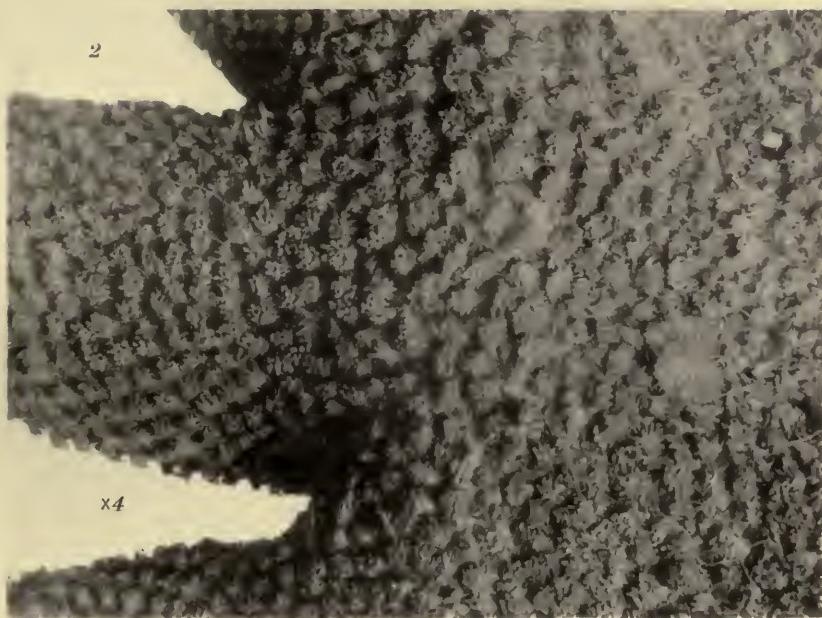
PLATE XCIV.

FIG. 1. *Solaster constellatus* Verrill. Type. Dorsal side; $\times 3$.
FIG. 2. *Solaster stimpsoni* Verrill. Type. Dorsal side; $\times 4$.

1



2

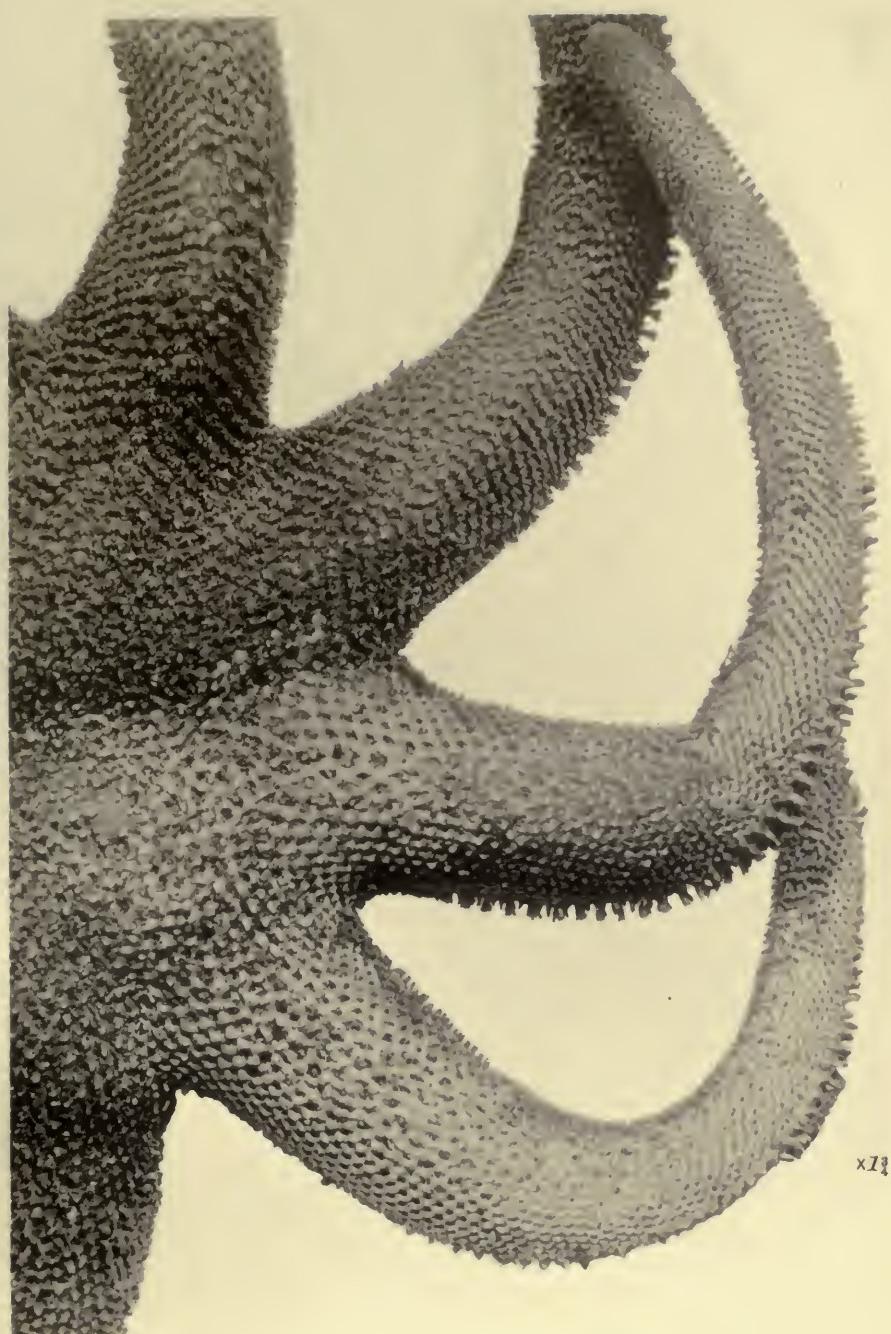


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1. SOLASTER CONSTELLATUS VER. Type
2. SOLASTER STIMPSONI VER. Type

PLATE XCV.

FIG. 1. *Solaster simpsoni* Verrill. Type. Dorsal side; $\times \frac{1}{3}4$. No. 5407,
Yale Mus.



HELIOTYPE CO., BOSTON

SOLASTER STIMPSONI VER. Type

PLATE XCVI.

FIGS. 1, 2. *Pteraster hebes* Verrill. Type. Profile and dorsal views; 1,
X about $1\frac{7}{8}$; 2, X 2. Departure Bay. Geol. Surv. Canada.

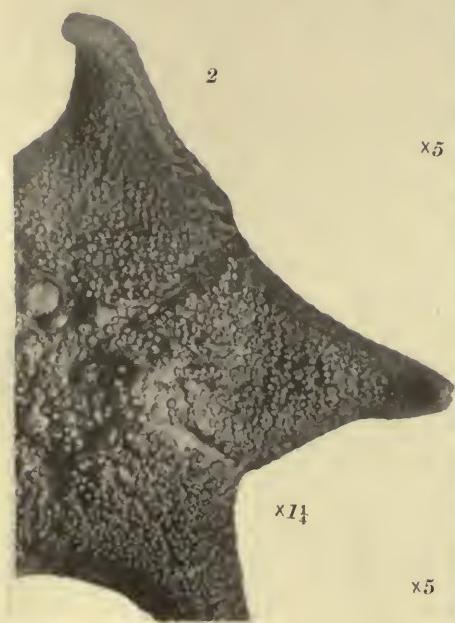


HELIOTYPE CO., BOSTON

1.2. PTERASTER HERES VER. Type

PLATE XCVII.

- FIG. 1. *Pteraster tesselatus* Ives. Actinal side of an alcoholic specimen from Alaska; about $\frac{3}{4}$ natural size. Yale Mus.
- FIG. 2. *Dermasterias imbricata* (Grube), var. *valvifera* Verrill. Type. Dorsal side, showing abundant pedicellariae; $\times 1\frac{1}{4}$. Yale Mus.
- FIGS. 2a, 2b. The same specimen. Portions of disk; $\times 5$. fig. 2a, shows many three-valved pedicellariae and some four-valved; fig. 2b, shows also the madreporite.

 $\times 5$ 

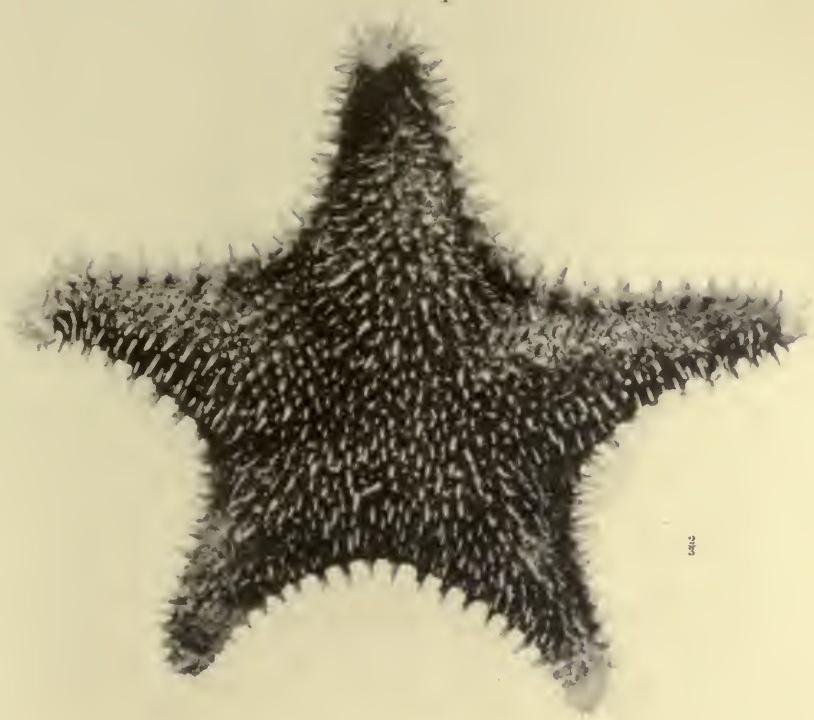
2a

 $\times 5$

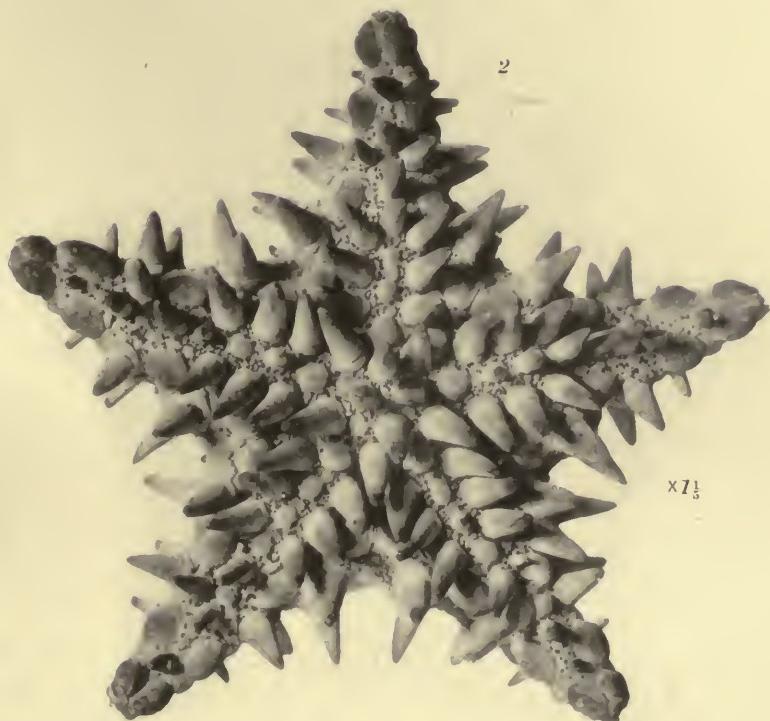
PLATE XCVIII.

- FIG. 1. *Hippasteria spinosa* Verrill. Type. Dorsal side; $\frac{2}{3}$ natural size.
Puget Sound. Univ. of Wash.
- FIG. 2. *Amphiaster insignis* Verrill. Type. Dorsal side; $\times 1\frac{1}{2}$. La Paz,
Lower Calif. Yale Mus.

1



2



HELIOTYPE CO., BOSTON

1. *HIPPASTERIA SPINOSA* VER. Type
2. *AMPHIASTER INSIGNIS* VER. Type

PLATE XCIX.

FIG. 1. *Tosiaster arcticus* Verrill. Dorsal side; $\times 1\frac{3}{4}$.

FIG. 2. The same specimen. Actinal side; $\times 1\frac{7}{8}$. Bering Is. U. S. Nat. Mus.

1



2

2

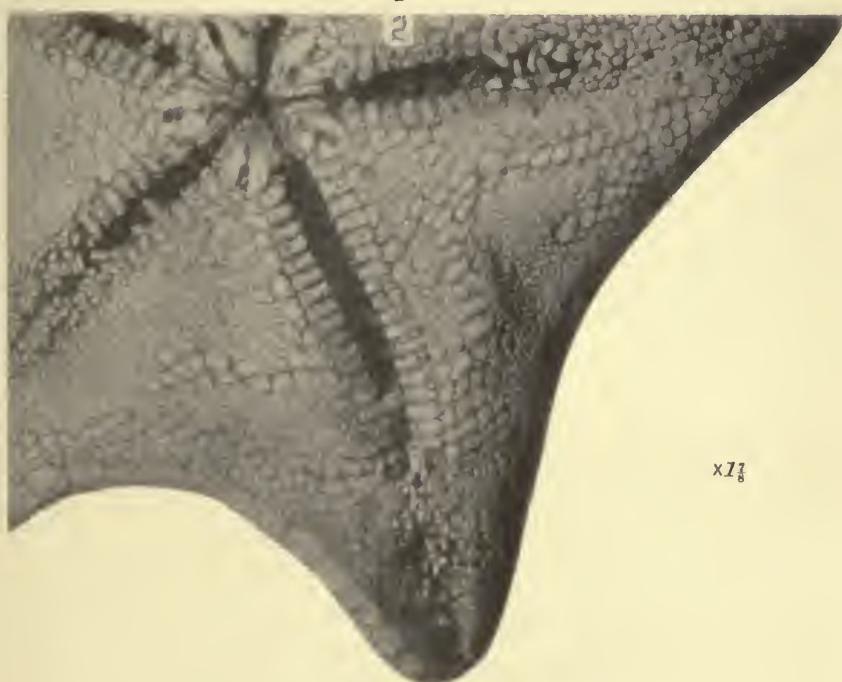
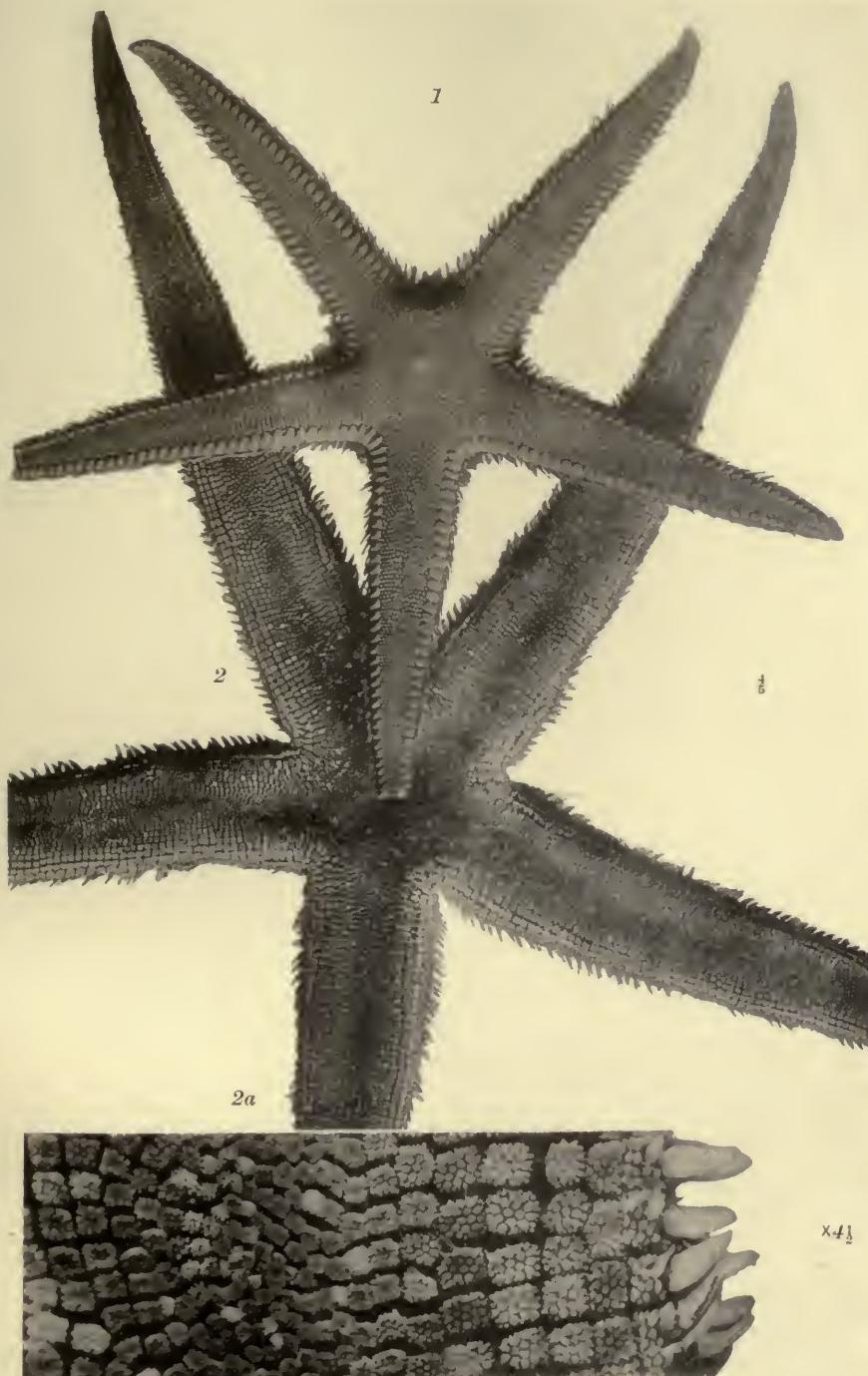


PLATE C.

- FIG. 1. *Astropecten californicus* Fisher; $\frac{4}{5}$ natural size. San Francisco.
FIG. 2. *Luidia foliolata* (Grube). Dorsal side; $\frac{4}{5}$ natural size. San Francisco.
FIG. 2a. The same. Portion of a ray; $\times 4\frac{1}{2}$.

(202)

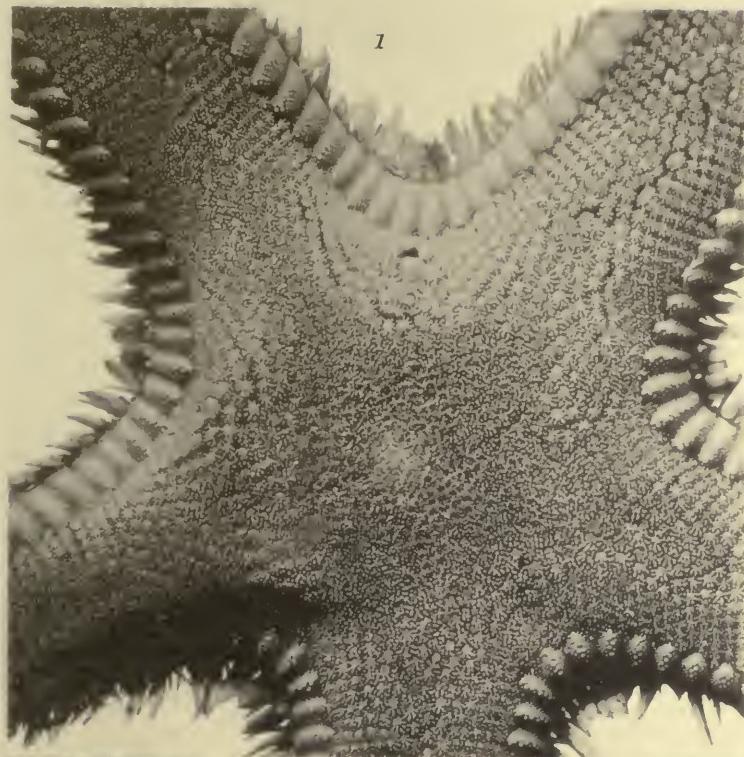


HELIOTYPE CO., BOSTON

1. *ASTROPECTEN CALIFORNICUS* FISHER
2.2a. *LUDIA FOLIOLATA* GRUBE

PLATE CI.

FIG. 1. *Astropecten californicus* Fisher. Dorsal side; $\times 3$. San Francisco.
FIG. 2. The same specimen. Actinal side; $\times 2\frac{1}{3}$.



x3



x2½

HELIOTYPE CO., BOSTON

ASTROPECTEN CALIFORNICUS FISHER

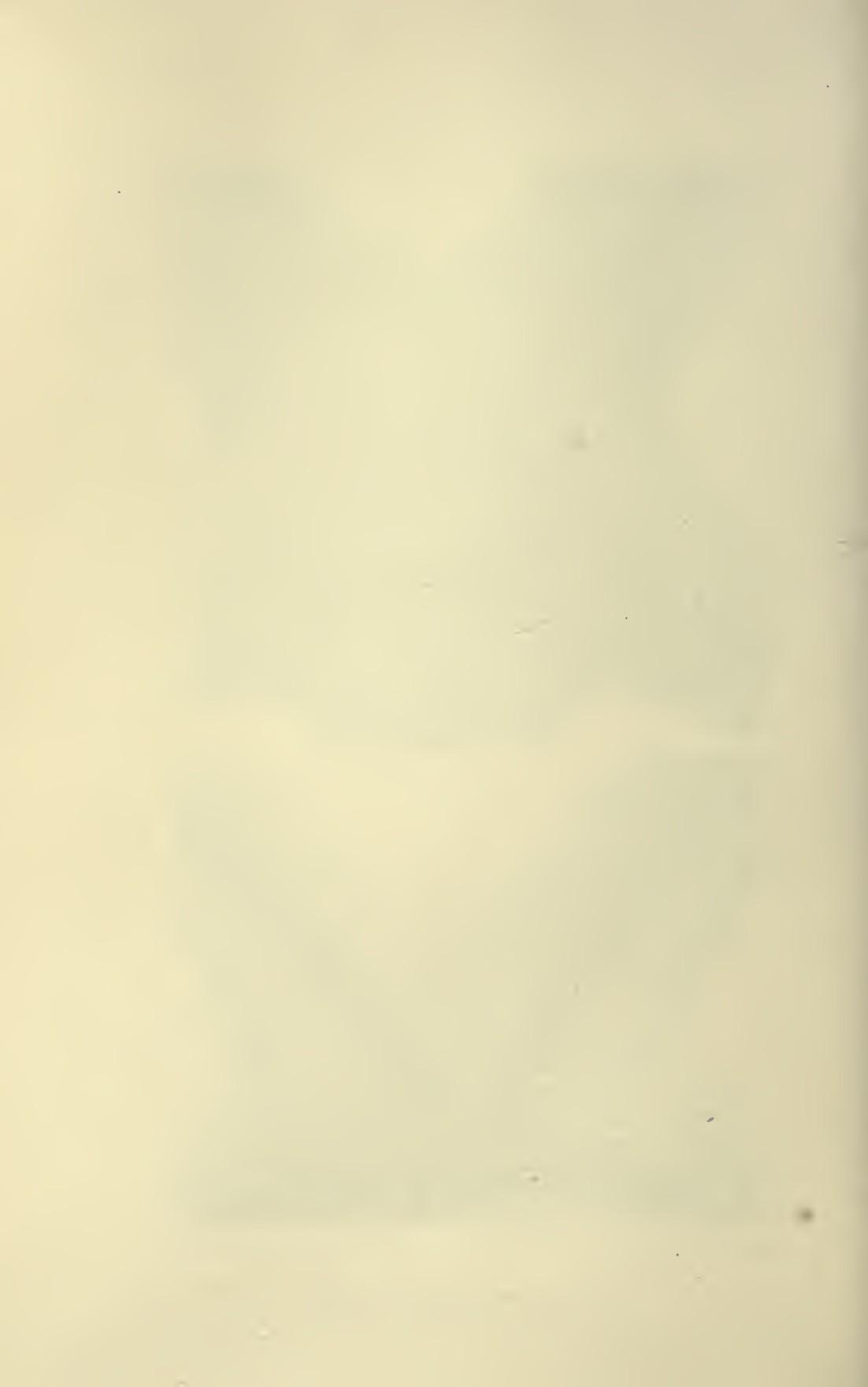
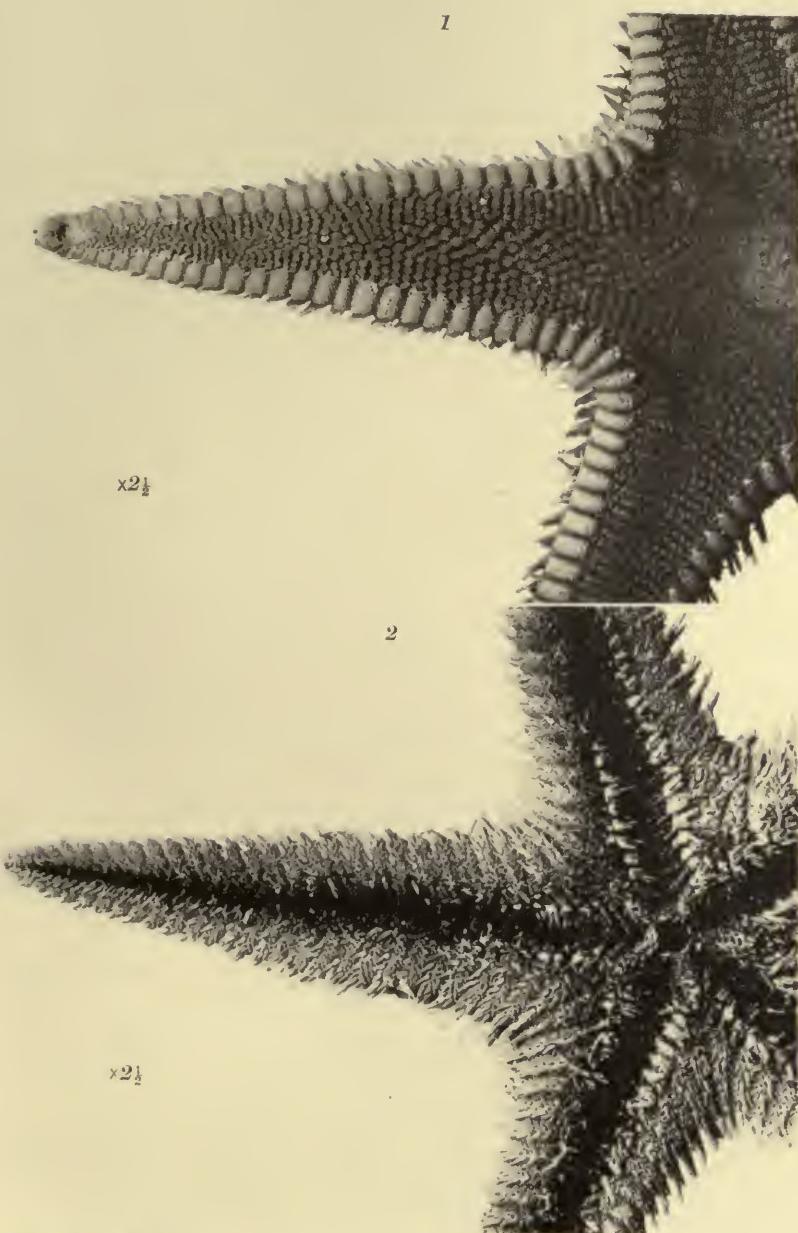


PLATE CII.

FIG. 1. *Astropecten californicus* Fisher. Young. Dorsal side; $\times 2\frac{1}{2}$. Off San Francisco. Yale Mus.
FIG. 2. The same specimen. Actinal side; $\times 2\frac{1}{2}$.

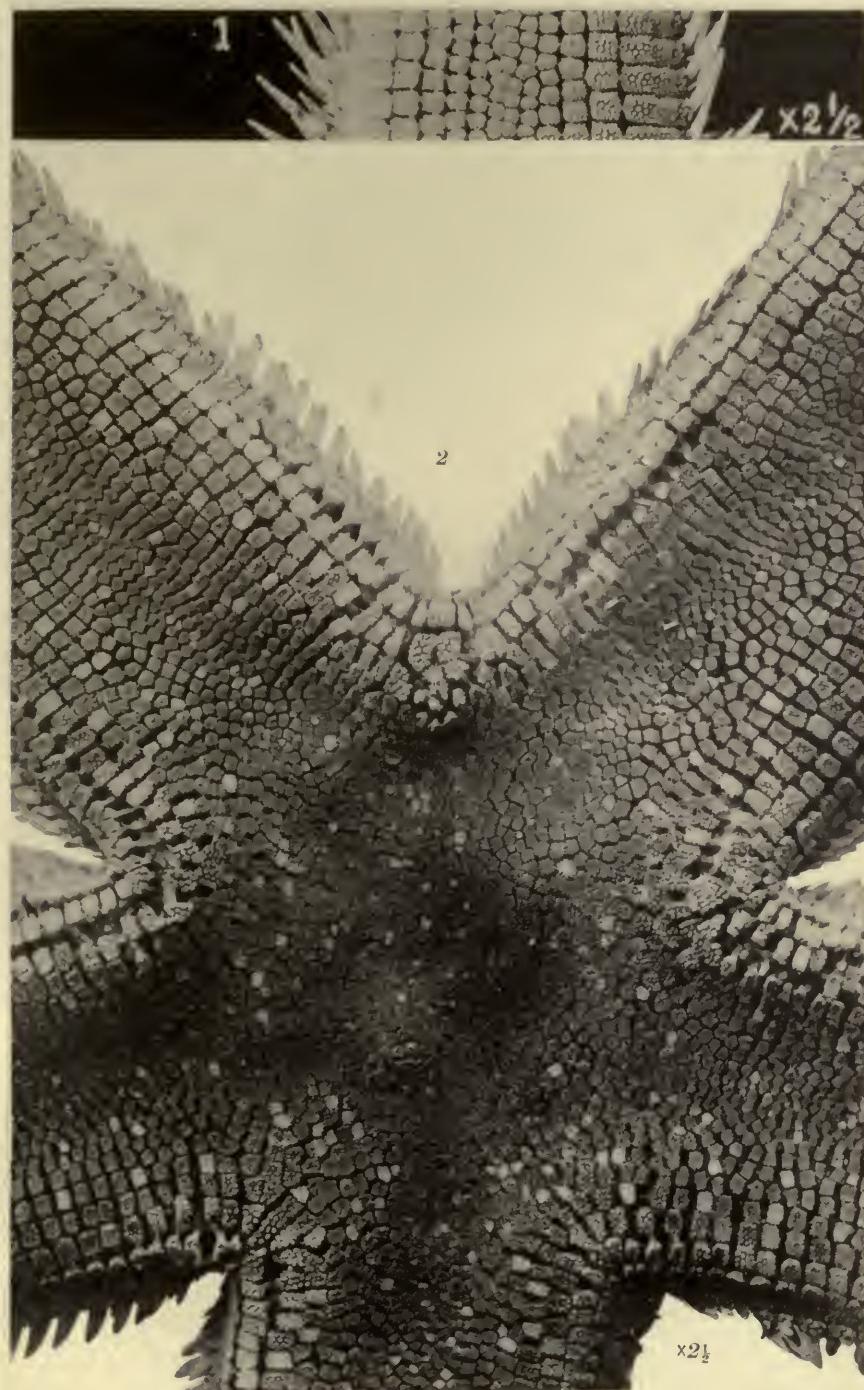


HELIOTYPE CO., BOSTON

1.2. ASTROPECTEN CALIFORNICUS FISHER (YOUNG)

PLATE CIII.

- FIG. 1. *Luidia clathrata* (Say). Dorsal side of ray; $\times 2\frac{1}{2}$. Bermuda.
FIG. 2. *Luidia foliolata* (Grube). Dorsal side; $\times 2\frac{1}{2}$. San Francisco.
Yale Mus.



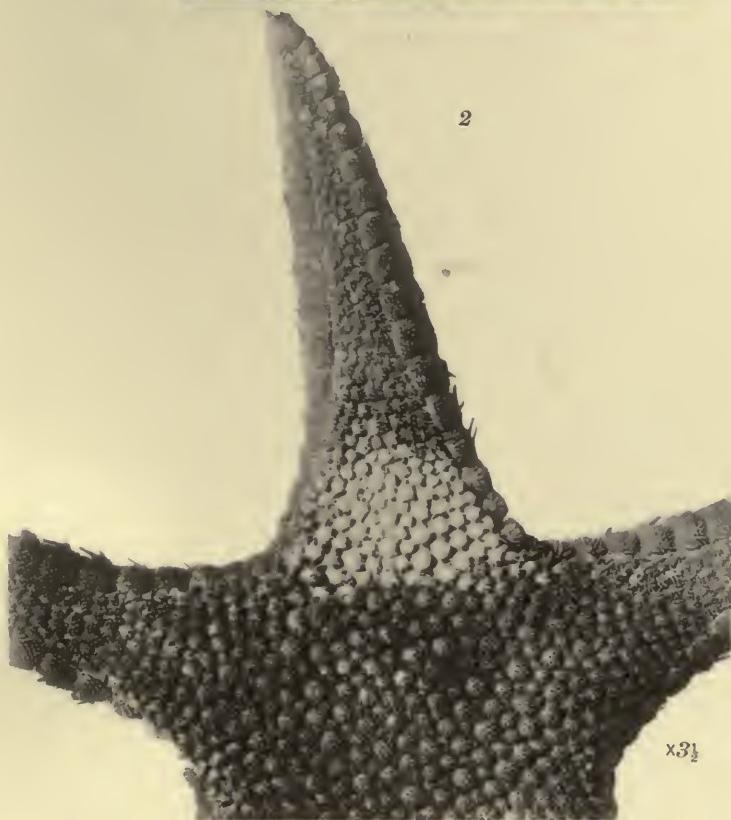
HELIOTYPE CO., BOSTON

1. *LUIDIA CLATHRATA* SAY.
2. *LUIDIA FOLIOLATA* GRUBE

PLATE CIV.

FIG. 1. *Bunodaster ritteri* Verrill. Type. Actinal side; $\times 3\frac{1}{3}$. Off San Francisco. Yale Mus.

FIG. 2. The same specimen. Dorsal side with spines removed on base of one ray; $\times 3\frac{1}{3}$.



HELIOTYPE CO., BOSTON

BUNODASTER RITTERI VER. Type

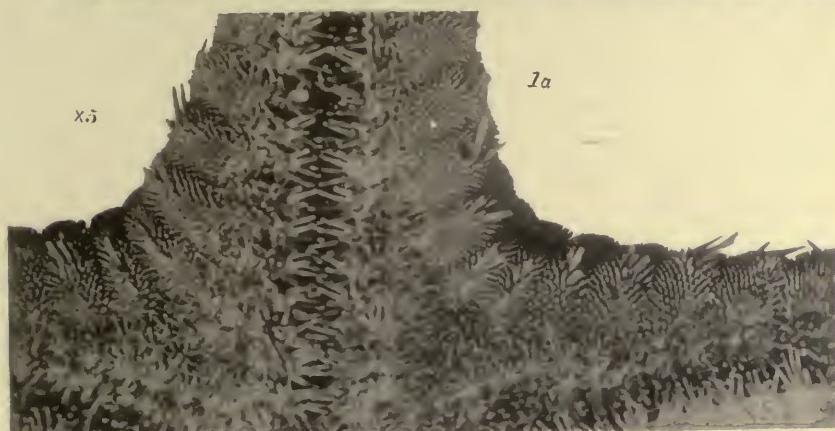
PLATE CV.

- FIGS. 1, 1a. *Bunodaster ritteri* Verrill. Type. Portions of the dorsal and actinal surface; $\times 5$. San Francisco.
- FIG. 2. *Luidia foliolata* (Grube). Same specimen as pl. c, fig. 2. Actinal side; $\times 2$. Off San Francisco.

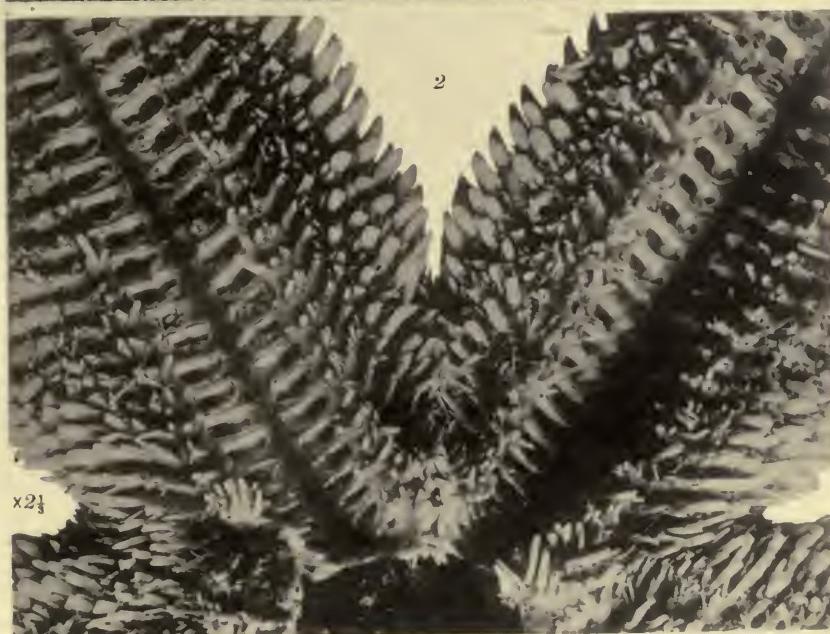
I



1a



2



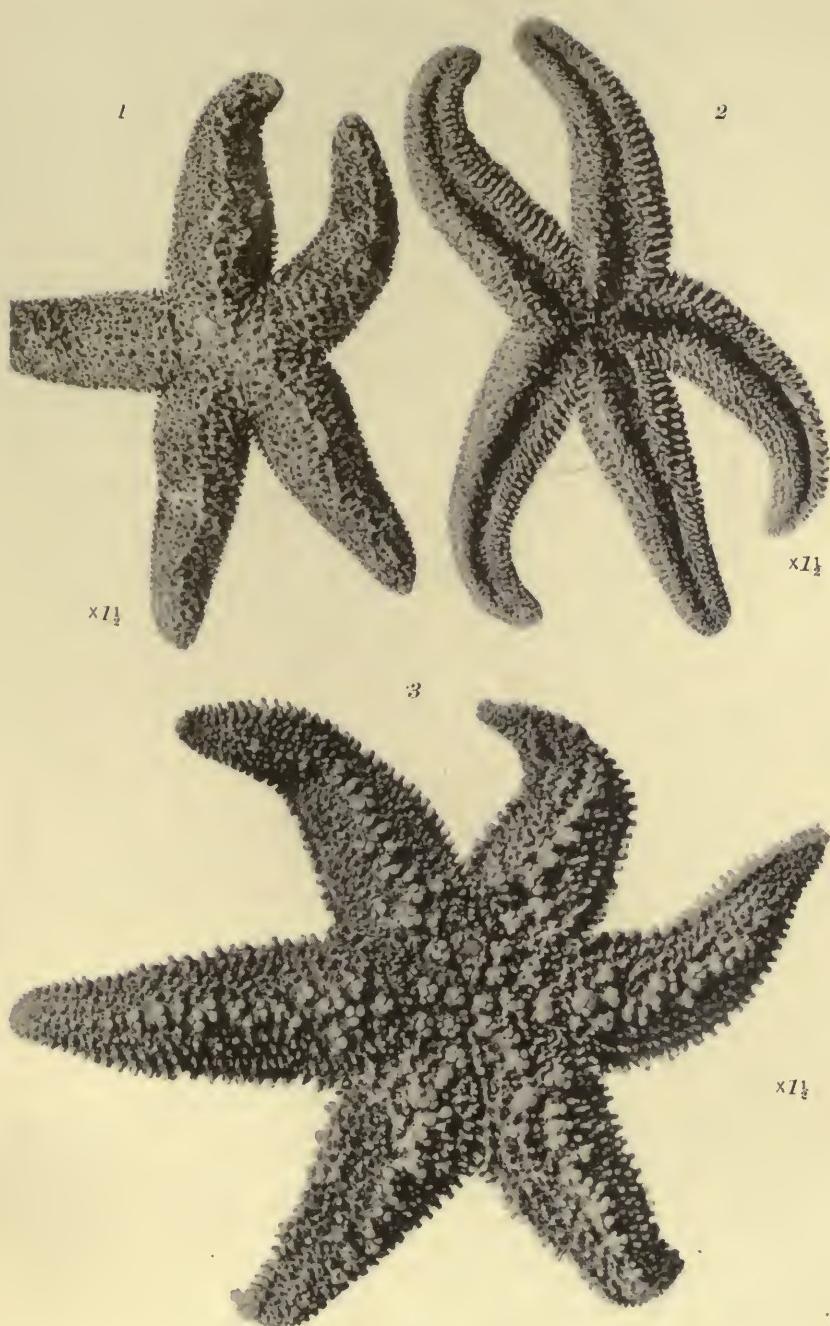
HELIOTYPE CO., BOSTON

1.1a. *BUNODASTER RITTERI* VER.

2. *LUDIA FOLIOLATA* GRUBE

PLATE CVI.

- Figs. 1, 2. *Evasterias troschelii* (Stimpson) Verrill. Young. Dorsal and actinal sides; $\times 1\frac{1}{2}$. Sitka. Yale Mus.
- FIG. 3. *Asterias acervata* Stimpson. A strongly acerate young specimen; $\times 1\frac{1}{2}$. Nazan, Alaska (Dall). U. S. Nat. Mus.

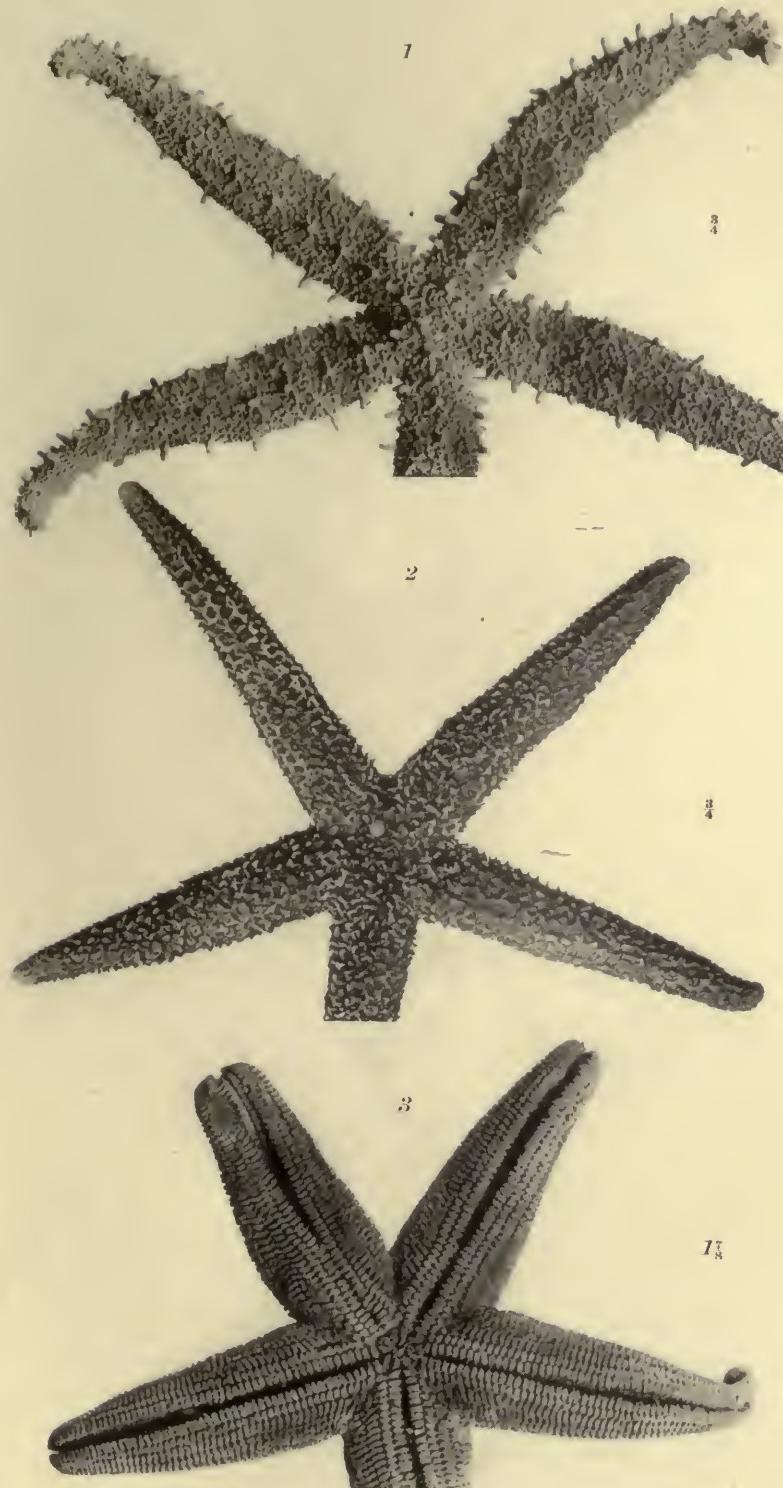


HELIOTYPE CO., BOSTON

1.2. *EASTERIAS TROSCHELII* (St.) YOUNG
3. *ASTERIAS ACERVATA* (St.) YOUNG, VAR.

PLATE CVII.

- FIG. 1. *Mithrodia bradleyi* Verrill. Type. Dorsal side; $\frac{3}{4}$ natural size.
Yale Mus.
- FIG. 2. *Echinaster tenuispinus* Verrill. Type. Dorsal side; $\frac{3}{4}$ natural size.
La Paz. Yale Mus.
- FIG. 3. *Henricia leviuscula spiculifera* Clark. Actinal side; $\times 1\frac{1}{8}$. Bering
Island. U. S. Nat. Mus.



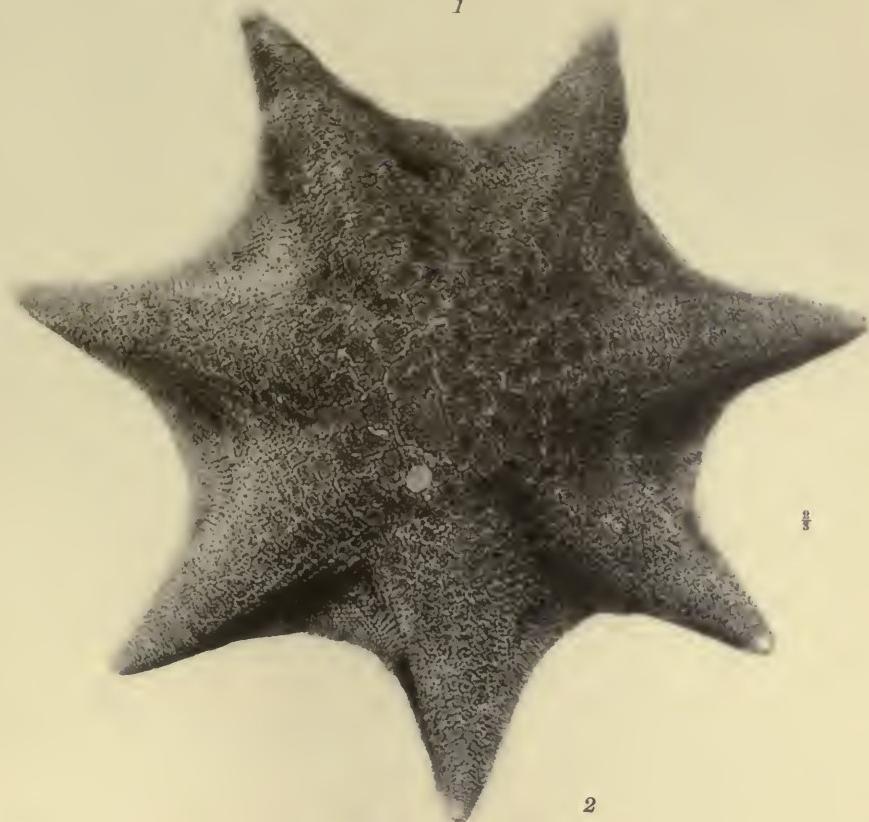
HELIOTYPE CO., BOSTON

1. *MITHRODIA BRADLEYI* VER. Type
2. *ECHINASTER TENUISPINUS* VER. Type
3. *HENRICIA LEVIUSCULA SPICULIFERA* (CLARK)

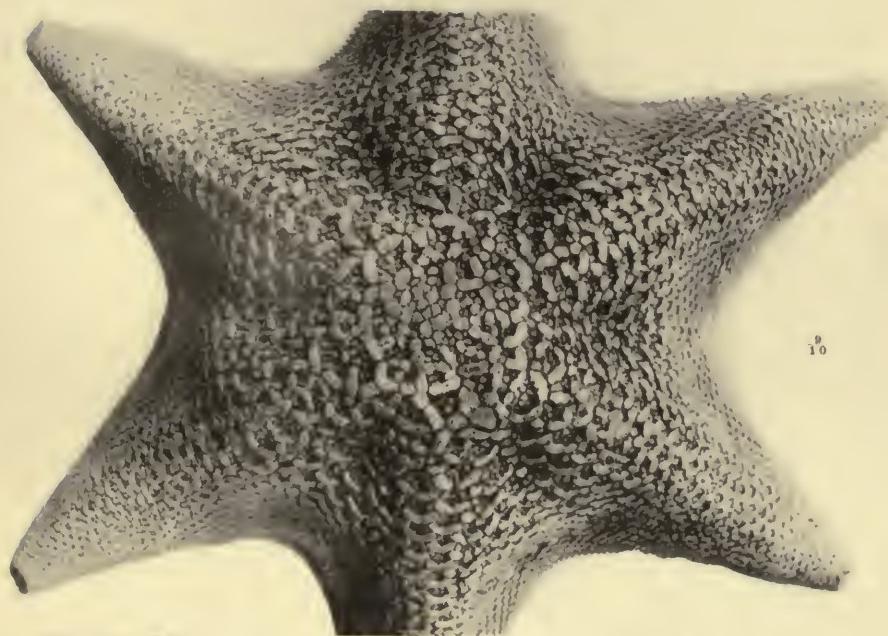
PLATE CVIII.

- FIG. 1. *Patiria miniata* (Brandt). A seven-rayed specimen. Dorsal side; about $\frac{2}{3}$ natural size. Departure Bay, Canada Geol. Survey.
- FIG. 2. The same. A six-rayed specimen. Dorsal side; about $\frac{9}{10}$ natural size. Departure Bay, Canada Geol. Survey.

1



2



9
10

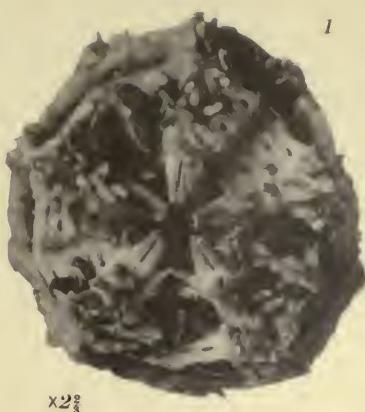
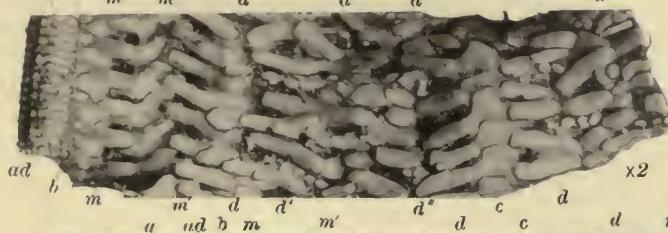
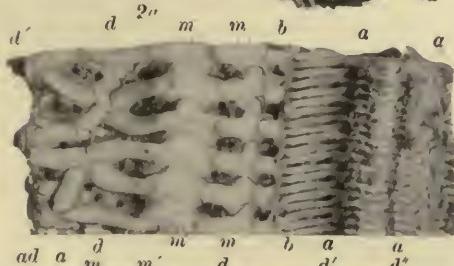
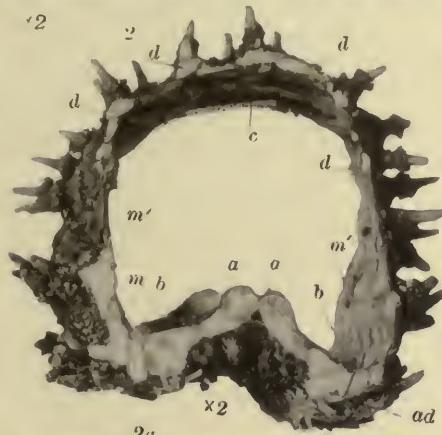
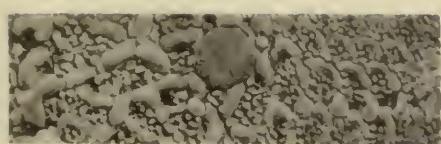
HELIOTYPE CO., BOSTON

1. 2. *PATIRIA MINIATA* VER. Varieties

PLATE CIX.

- FIG. 1. *Orthasterias tanneri* Verrill. Cotype. Actinal side of disk, to show jaws and peroral spines; $\times 2\frac{1}{3}$.
- FIG. 1a. The same specimen. Dorsal side of disk, showing spines and pedicellariæ; $\times 2$.
- FIG. 1b. The same specimen. Section of a ray, showing inner surface of skeleton; cut through ambulacral plates and flattened out; *a, a*, ambulacral plates; *ad, ad*, adambulacral plates; *b, b*, peractinal plates; *m, m*, inferomarginals; *m', m'*, superomarginals; *d, d*, dorso-lateral plates and transverse connective ossicles; *s, s*, adambulacral spines; *c, c*, median radial or carinal plates; $\times 2\frac{1}{3}$.
- FIG. 2. *O. columbiana* Verrill. Type. Transverse section of a ray; *a, a*, ambulacral plates; *ad, ad*, adambulacrals; *b, b*, peractinals; *m, m*, inferomarginals; *m', m'*, superomarginals; *d, d*, dorso-lateral plates and transverse ossicles; *c*, carinals; $\times 2$.
- Figs. 2a, 2b. The same specimen. Two parts of a transverse section of a ray, split through the ambulacral plates and flattened out, to show inner surface. Lettering as in fig. 1b, except that *d, d; d' d'; d'', d''* show the three rows of dorso-lateral plates; $\times 2$.
- FIG. 3. *Patiria miniatia* (Brandt). Central part of disk and madreporic plate, with spinules removed; $\times 2$.
- FIG. 4. *Enoplopatiria siderea* Verrill. Type. Dorsal view of middle of a ray with spinules removed; $\times 2$.

3



1a



4

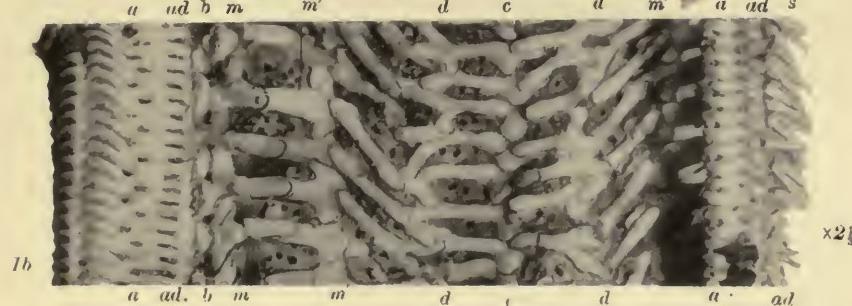
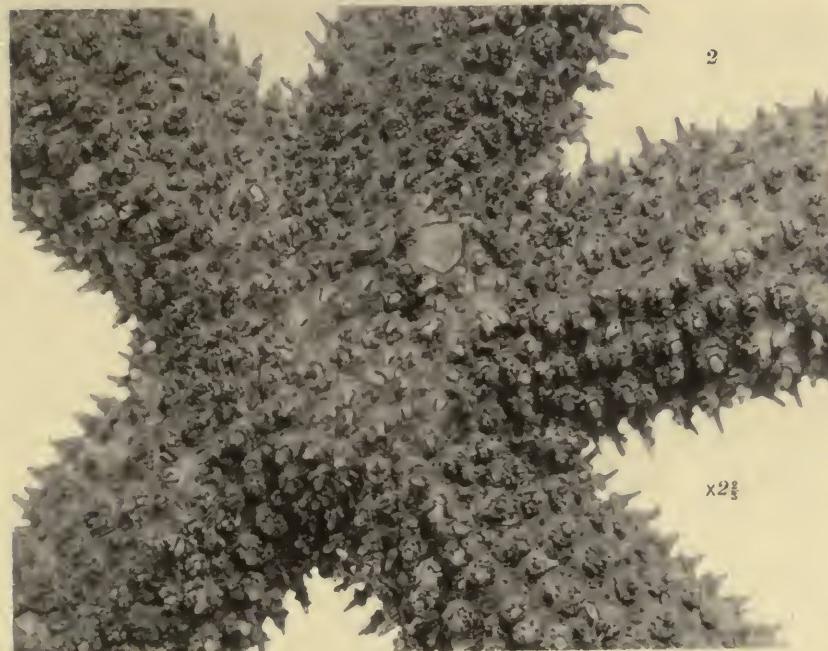
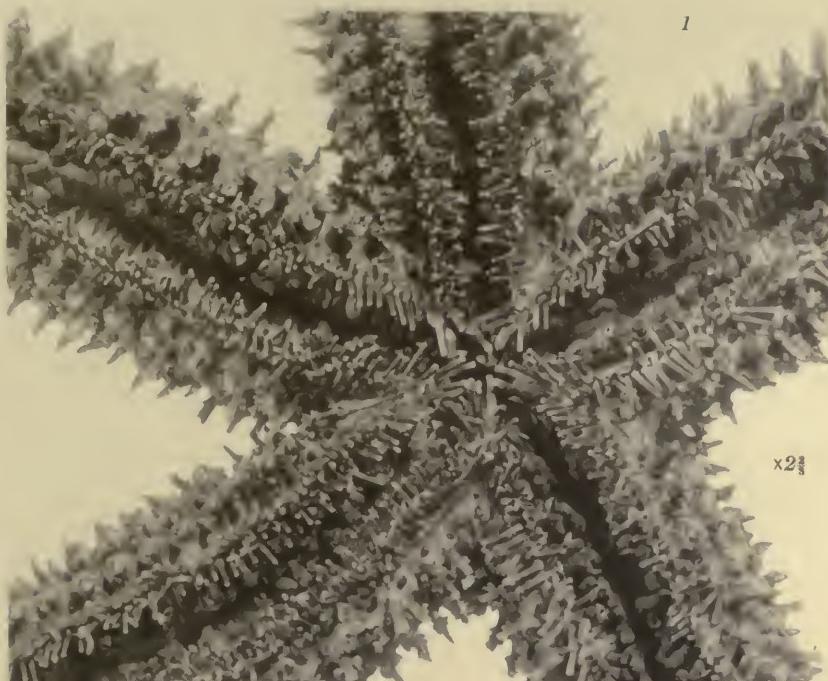
1-1b. *ORTHASTERIAS TANNERI* VER. Cotype2-2b. *O. COLUMBIANA* VER. Type3. *PATIRIA MINIATA* (BR.)4. *ENOPLOPATIRIA SIDEREA* VER. Type

PLATE CX.

Figs. 1, 2. *Distolasterias chelifera* Verrill. Type. Ventral and dorsal views;
 $\times 2\frac{2}{3}$.



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1-2. *DISTOLASTERIAS CHELIFERA* VER. Type

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